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Published monthly by ORGANIC GARDENING. Publication, Executive, Editorial, Subscription and Advertising Offices; 6th and Minor Streets, Emmaus, Pa. Subscription Rates, United States and Possessions, One Year $3.00, Two Years $5.00, Three Years $6.00. Unless otherwise directed all subscriptions begin with the current issue. Renewal subscriptions begin immediately after old subscription expires. When changing an address, give the old address as well as the new. Manuscripts should be accompanied by full return postage and a self-addressed envelope. Printed in United States of America. Copyright 1949 by ORGANIC GARDENING. Entered as second class matter at the Post Office, Emmaus, Pa.; under Act of March 3, 1879.

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Dear Sirs:

I am sending you a snapshot taken of some squash fruits that grew on our land this past summer. When we moved here all my neighbors said it is wasted time to plant a garden in such sandy soil. My garden was a nice sight to see, as everything was so healthy. I did not need to spray, thanks to compost and new land.

The squash seed was over three years old. Of 7 seeds, two weak plants showed up. Later in the summer I mulched them with compost and they grew vigorously in spite of a dry summer. The three squash fruits in the picture grew on the same plant. When harvested their total weight was 100½ pounds, the heaviest weighing 38½ pounds. No more chemical fertilizers for me.

Mrs. Walter Niles,
Route No. 2,
Tawas City, Michigan.

—o—

SOW BUGS AS ALLIES

Dear Sir:

I should like to pass on to the many readers of Organic Gardening an experience of mine with the ordinarily

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Question: I can't get enough good manure for hot beds. Is there anything which will substitute?

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destructive Sow Bug, or Pill Bug, as they are sometimes called.

For some years now my yard has been run according to the organic way, and I maintain a heavy mulch around the fruit trees and berry bushes. This mulching has not only attracted earthworms in large quantity, but I believe all the Sow Bugs of the neighborhood have collected there too. Although in this area, Sow Bugs are considered to be a pest very difficult to control, I have found that apparently the decaying vegetation of the mulch is their natural food and they never leave that area. Even such tender delicacies as pansies are no temptation for them.

The earth under the mulch is now as black as ink, and loaded with earthworms, and the skeletons of thousands of Sow Bugs that have died at the end of their natural span of life. As long as the bugs will work *for* me in the digesting of the organic matter, and don't do damage even to tender lettuce which grows right along side of the muched areas, far be it from me to disturb their happy existence.

I hope that this information will be of some comfort to other readers.

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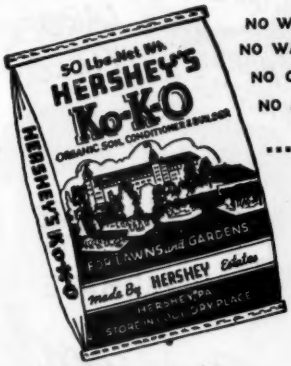

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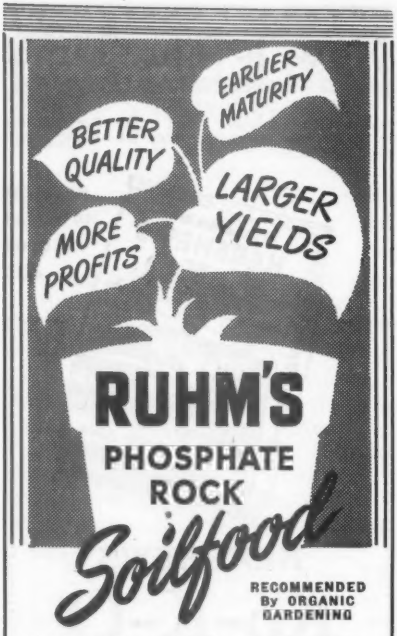

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Dear Editor:

Near my compost pen is a pile of partly decayed sawdust. It is used to top it off; also around the edges for an absorbent. It prevents any stickiness resulting from too much moisture. This particular pile of sawdust extends back near and into the shade of a native persimmon tree that bears yearly. The layer of partly decayed sawdust—which was from 2 to 3 inches deep and kept moist, became infested with persimmon seedlings and I wondered, will that happen with apple seeds? A trial proved it to be an excellent method.

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Nitrates Attacked By Soil Scientist

AN article has just been published in the Agronomy Journal (Jan. 1949), entitled *Nitrate in Foods and its Relation to Health*, written by Dr. J. K. Wilson of the Department of Agronomy of the N. Y. State College of Agriculture (Cornell) which represents a revolution in agricultural thinking. It may spell the end of the artificial chemical NPK tradition, as far as artificial, synthetic chemical N is concerned—that is nitrogen in the form of nitrates. This article is an especial indictment of the fertilizer, nitrate of soda regarding the use of which we have always been so violently opposed.

Dr. Wilson begins his article with the following statement: "In 1943, the author pointed out that nitrates in the food of animals may be reduced by bacteria to nitrites and that these are likely to cause poisoning through combination with the hemoglobin of the blood." Nitrate is NO_3, that is one atom of nitrogen and three atoms of oxygen. When one of the oxygen atoms is lost from the molecule, we then have NITRITE, that is NO_2. It would seem that the nitrate is unstable. Sir Albert Howard, the father of the organic farming idea, always referred to the synthetic fertilizer nitrates as containing bastard nitrogen. Now, we can see what he meant.

Evidently this subject is not a new one. Wilson mentions another group of men (Gilbert, Eppson, Bradley and Beath) who in 1946 published a paper sponsored by the Wyoming Agricultural Experiment Station (Bulletin 277) which stated that analyses of plants were made for their contents of nitrate and re-emphasized the effect of this material on human health, as did Wilson himself in 1943.

Wilson goes on, "Recently, Weart, working as a sanitary engineer in Illinois, drew attention to a new disease called *infant Methemoglobinemia* which was said to be due to too much nitrate in the drinking water. In Illinois alone 33 cases of the disease with 5 deaths were reported in 1947. A maximum safety limit of 10 parts of nitrate per million of water has been set by certain authorities." This is self-explanatory. Let's go a bit further in Wilson's article:

"The nitrate content of any food is a direct measure of the potential amount of nitrite that may appear, and the toxicity that follows will depend on the rapidity of the reduction. The data in the tables may be used as an indication of what may happen. In Table I, is given the nitrate content of green vegetables grown at Ithaca, N. Y. It can be seen that only tomatoes contained no nitrate and that 7 of the 14 vegetables contained at least 1,000 parts per million in the juice. Broccoli, cabbage and cauliflower were found to contain 1,000 parts per million or more in their juice and rhubarb contained as much as 5,454 parts per million:

TABLE 1

	Nitrate parts per million
Beets	1,333
Broccoli	785
Broccoli	3,846

Cabbage	2,222
Carrots	442
Cauliflower	2,000
Celery	1,212
Cucumber	121
Lettuce (head)	1,250
Lettuce (curly)	870
Muskmelon	433
Rhubarb	5,454
Rhubarb	1,000
Tomatoes	0
Watermelon	100
Watermelon	1,000

Table 2 contains analyses of nitrates found in the juice of green vegetables and quick frozen foods for sale at Ithaca, N. Y. in May 1948:

TABLE 2

	Nitrate parts per million
Asparagus	50
Cabbage	1,200
Cabbage	186
Carrots	325
Carrots (diced, quick frozen)	181
Celery (Fa)	1,240
Celery (pascal)	3,232
Lettuce (curly)	1,818
Lettuce (head)	400
Potatoes (new)	63
Rhubarb	1,818
Rhubarb	4,545
Radish	303
Radish	1,176
Spinach	300
Spinach (plant 1)	2,353
Spinach (plant 2)	1,600
Spinach (plant 3)	2,000
Spinach (quick frozen)	3,636

In Table 3, nitrate content of strained baby foods obtained on the market was determined as follows:

TABLE 3

	Nitrate parts per million
Green beans	37
Beets	333
Beets	750
Carrots	3
Carrots	0
Peas	0
Spinach	616
Spinach	833
Squash	0
Squash	0
Vegetable soup	37

With regard to the above Table 3 Wilson says: "The variations in nitrate content of certain vegetables can be seen also from the data listed in Table 3. One sample of strained beets labeled baby food contained 333 ppm, whereas another contained 750 ppm. Likewise, a sample of spinach contained 616 ppm, whereas another contained 833 ppm. This is taken to mean that the nitrate content of any vegetable will vary, perhaps, depending on the amount of nitrate that is accessible to the growing plant."

I am submitting herewith the next five paragraphs of Dr. Wilson's article word for word:

"The data presented in this paper record the content of nitrate in many vegetables and vegetable foods that are consumed by humans and carries the idea that each ion of nitrate that was found is a possible source of nitrite that is about ten times more toxic than the nitrate from which it came. If the nitrate ions were not reduced to nitrite, little or no concern should be felt about its concentration in foods or drinking water. Because an unknown quantity of the nitrate may be reduced to nitrite, these data should be of timely importance.

"It is apparent from the data that probably most succulent leafy vegetables contain some nitrate in their juice and this is present very likely in proportion to the quantity that was available to the growing plant. The edible parts of spinach, rhubarb, cauliflower, turnips, and cabbage may contain in their juice at least the equivalent of 15,352 ppm of potassium nitrate, which is equivalent to approximately 9.4% of the dry weight. As much as 10.2% (1) and 11.1% (2) of the dry weight of spinach and turnips respectively have been reported. This nitrate may be carried with the leafy material and appear in fresh vegetables from the garden, in those offered for sale on the market, or in

strained baby foods. Such quantities may be larger if the vegetables are allowed to wilt some before they are analysed or if their moisture is spontaneously reduced when the plants are in the field. Many other factors can operate to modify this content of nitrate (1,2) and data indicate that the fruit contains much less nitrate than supporting tissues carry (5). This may be true particularly of tomatoes, squash, ears of corn, green peas, and similar foods. These quantities of nitrate are paralleled by similar quantities in numerous other plants. Mayo (3) reported that potassium nitrate represented 25% of the dry weight of certain samples of corn stalks.

"Weart (4) reported cases of hemoglobinemia in infants caused by nitrate in the drinking water and suggested the maximum safety limit of 10 parts of nitrate nitrogen per million parts of water. He pointed out that doctors in Illinois have been advised not to prescribe feeding formulas involving water unless the nitrate content of the water is known to be within this limit. If the formulas contain vegetables such as those analysed and reported on in this paper, it is clear that the nitrates of such vegetables as spinach, lettuce, celery, turnips, and certain others may be far more potent in producing hemoglobinemia than that of the drinking water. Certainly the nitrate in the vegetables would augment that which may be present in the water. It may be suggested that in some cases the nitrate in the vegetable foods may be solely responsible for this ailment of babies and may cause other disturbances not now properly diagnosed, for the nitrate may be 200 times stronger in such foods than that which was set as the safe standard for the drinking water.

"More data are needed to appraise properly the effect of nitrate in foods on adults. It is well known that nitrate in feeds is associated with cornstalk disease, oat hay poisoning, borna disease of horses, grass tetany in cattle, and bloat in certain types of animals. Animals that ingest feed containing toxic but not lethal amounts of nitrate may abort the forthcoming offspring. Feeds that contain 1.5% of potassium nitrate were known to effect such a result although few grass symptoms in the mother were observed (2). Calculated on the dry basis, several foods listed in this paper contained as much or more nitrate than that present in feed which was injurious or lethal to animals.

"If it is assumed that 1 gram of potassium nitrate ingested at a single meal is toxic, a basis is available for evaluating the effect of nitrate on human adults. Using the findings recorded in this paper it would be necessary to ingest only 3.9 ounces of rhubarb to get a toxic quantity of nitrate. If one uses the findings of other workers and makes similar calculations, about 2.3 ounces of spinach, turnips, or certain other vegetables would supply the toxic quantity. The present practice of applying large applications of nitrate of soda to crops in order to produce succulent material with a bright green color and to obtain heavier yields may be responsible in most cases for the high content of nitrate in these foods."

Then Wilson sums up as follows:

"Leafy vegetables, frozen foods, and prepared baby foods were analysed for their content of nitrate. From the findings it is suggested that the nitrate in such foods may contribute to hemoglobinemia found in infants and may produce certain toxic, if not lethal, conditions in adults. The high content of nitrate in the foods may be attributed in many instances to the application of nitrogenous fertilizers, especially nitrate of soda, to the growing crops."

These findings are of extreme importance to vegetarians who usually depend so much on leafy foods. According to these figures they should eat such foods as carrots, peas, potatoes, squash, green beans, cucumber, muskmelon, tomatoes, corn and sunflower seeds in preference to the leafy foods. We have always been against rhubarb, because it also contains too large a quantity of oxalic acid which

is used as a chemical bleach for straw hats. Spinach contains also a significant amount of oxalic acid. This is especially bad for people with kidney and urinary complications.

The publication of this article opens up the need to experiment and to see whether the nitrates in organically produced foods are more stable and keep their nitrate form without turning to nitrites. The fact that there is so much evidence that people who eat organically produced food become healthier would seem to indicate that this is so, but it must be checked and it will be, I hope, soon.

Another trouble with nitrate of soda fertilizer is that the plant tends to absorb the nitrate but not the soda which pollutes the soil and forms the chemical equivalent of washing soda, which we know to be quite caustic. It hardens the soil and eventually makes it extremely difficult to cultivate, but it tends to blow up the crop and increase the yield. Organic fertilizers usually have much less nitrogen than the synthetic commercial fertilizers and that has been one of the contending points between the organiculturists and those of the artificial school.

The latter state that composts do not have sufficient nitrogen, that they might be satisfactory as a soil conditioner, but that the crop needs real, he-man fertilizer to really produce yields. It is admitted that composts usually have less nitrogen. Perhaps from the point of view of this new work, such deficiency may be conducive to the health of a person eating food grown with it. This summer when the Soil and Health Foundation's laboratory begins functioning this subject will be the first on the agenda for experiment. We understand that Dr. Wilson died before this article was printed. This is a great loss.

This work indicates the need for the public to procure food raised organically. Let me suggest that city people form clubs and interest farmers to raise food for them. This can be done even in cities as large as New York. Form the club first, and study and plan how you can get the farmer to give you and your children healthier food.

In regard to this new discovery, which shows that leaves contain the most nitrates I would like to quote something that I wrote in this magazine in the issue of March, 1945, in an article called "Seeds as Human Food":

"An experiment was performed where the effects of the use of a chemical fertilizer, superphosphate, was measured on a crop of alfalfa, in comparison with a similar crop on which no fertilizer was used. It was discovered that all the inorganic phosphorus of the fertilizer went to the stalk and leaves. The amount of organic phosphorus in both crops of seed was alike, because the seed rejected the inorganic phosphorus. Nature cannot build a good race of alfalfa plants by permitting too many minerals of inorganic origin, to find their way into the seed. The plant will forage about, and most of the "organic minerals" or minerals that already had formed part of an organism are probably saved for the seed. If sufficient organic elements cannot be found, the plant will either produce seed which anyone can see is defective, or it will not produce seed at all.

"This is an extremely important point to be carefully considered. Those of you who are worried about having to purchase food raised with chemical fertilizers, should see to it that a certain portion of your diet consists of seeds, because the seed is not anywhere nearly as much affected by the use of strong chemicals as the leaves or stalks, and contains thus significant amounts of organic elements."

In my book *Pay Dirt* I expressed the same idea (p. 126) as follows:

"A study made by Thomas H. Mather of the University of Alberta, Edmonton, shows that where superphosphate was used as the chemical fertilizer in a crop of various kinds of hay, "practically the entire increase in total phosphorus... was confined

to the inorganic phosphorus fraction." There was no increase in the organic phosphorus of the plant. Experimental work is needed in this field, but there is much evidence available to show the great difference in the form of minerals that come out of a mine and those produced by green manure or composts.

"In the Journal of *Industrial Engineering Chemistry*, (Vol. 4, 1912) R. C. Collison in an article entitled "Inorganic Phosphorus in Plant Substances," shows that the seeds of plants contain more phosphorus in organic combination than the other organs of the plant. This is a method nature uses for the perpetuation of the species. The seed must have the most strength, and the most potency in order to be able to carry on into the next generation. And when there is a certain amount of organic mineral available, as much as is possible of it is conserved for the seed. When chemical fertilizers are used there is an insufficient amount of organic mineral produced to give the seed the necessary reproductive strength. As a consequence, seed or plant strains die out."

These ideas harmonize remarkably with the nitrate theory of Dr. Wilson. Peas and corn, which the work of Wilson indicates have little or no nitrates, are seeds. Other seed foods are nuts, the grains, sunflower seeds. Incidentally the seeds of apples and citrus fruits if well chewed are highly nutritious.

Well, this is indeed a happy day for organiculture. A governmental agricultural organization has unqualifiedly stated that there is some connection between the use of a commercial fertilizer and human health. I am not writing this in a spirit of I-told-you-so, but in a humble hope that Governmental agencies throughout the land will take up this subject in which Dr. Wilson has pioneered.

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THE LOWLY DANDELION —

Rich in Food Values

By M. B. CUMMINGS

Professor Emeritus, University of Vermont

THAT pestiferous weed of the lawn wins respect when one considers its value as food when cut in season and carefully prepared for the table.

Dandelion greens in early spring have a high food value. They contain 11% of carbohydrates (starch and sugar), 5% of ash or mineral ingredients, nearly 3% of protein, a food factor in many meats and legumes such as peas and beans. Furthermore, dandelions are rich in vitamins. The food value in energy and calories is 285 units per pound, not large to be sure but higher than in asparagus, celery, beets, collards, eggplant, tomatoes, squash, spinach and lettuce. Our grandmothers insisted that the dandelion was a potent spring tonic in its natural state, and they were right. No other vegetable delicacy was sought in the early days more eagerly by country folk; and it was often considered a gift from the gods for the good it did in supplying certain needs of the body, as shown by practical tests and early benefits.

It will not be long now before housewives and their children, armed with pails, pans and long knives, will set forth to cut or pry the succulent dandelion from its moorings for the traditional pot of greens. A wild garden may become in part a good garden for victory over famine.

And yet a little later on this looked for vegetable can be bought at the door from salesladies or even at the grocers at reasonable prices. Dandelions are now grown in frames and sold by the bushel in clean, fresh condition and worth the price. Sometimes they are bleached in the coldframe by excluding light and in due time the whitened product is available for salad. Some cultivated varieties resemble endive. Dandelions are more nutritious, however, if green rather than white, and tender not tough.

When cultivated, the seed of this green is sowed in the place where the crop is to grow and needs little care. The crop is harvested like spinach. The cultivated forms have been derived from the wild species, *Taraxicum officinalis*, of waste places.

What better use can be made of this pernicious weed than to eat it and benefit from its use as food? To devour an enemy is to exterminate it; and there is no remorse.

Sheet Composting On The Farm

By DR. WILLIAM H. EYSTER

THE objection is sometimes made that the compost method of farming is not practical. Other objections often made are that it requires too much labor, green matter is not available in sufficient amounts, manure is hard to get, and farm equipment for the compost method is not available. These objections, even for making compost in pits, are more apparent than real. Such helps as the hydraulic manure loader and automatic elevators take most of the labor out of the handling of the materials. Plant material grinders, mechanical digesters, earthworms, and special cultures of the organisms which convert the raw organic materials into compost greatly shorten the time required for making compost.

An effective type of composting, known as *sheet composting*, lends itself well to the farm equipment and practices with which every farmer is familiar. The factors involved in the transformation of green matter and manure into humus in the soil are the same as those in the compost heap. All factors must be favorable and must act together.

Grow a Cover Crop for Green Matter

Green matter is grown in the form of a cover crop. Recommended cover crops are kudzu beans, sweet clover, other clovers, alfalfa, soy and other beans, crotolaria, vetch and other legumes, brome and other grasses; and for soils lower in fertility, rye and buckwheat. The growing of these cover crops requires no special equipment. They are worked into the soil with manure and lime to form compost.

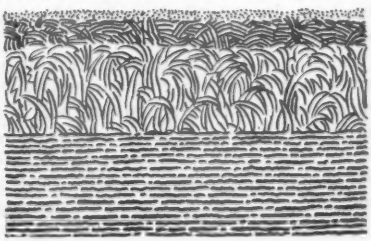
Apply Manure and Lime with Regular Equipment

The manure can be applied in the regular way with a manure spreader at the rate of from 3 to 5 tons per acre. The raw limestone which has been pulverized to colloidal particles may be applied with the manure, or may be drilled in the field with a regular lime drill. Fig. 1 shows, in vertical section, the surface layer of the soil, the cover crop, the manure, and the lime ready to be worked into the soil.

After the manure and lime have been spread over the cover crop, all these materials must be incorporated into the surface layer of the soil. It matters little with what equipment this is done, so long as the organic matter is near enough the surface of the soil where there is sufficient oxygen from the air to enable the aerobic organisms to break down the organic matter and convert it into humus. If the plow is used, do not plow deeper than 4 or 5 inches. Other suitable equipment include the disc, rototillers, and other types of tillers.

Nature Supplies Suitable Moisture and Temperature

The moisture necessary for the composting process is inherent in the green matter and the soil, and is renewed from time to time by the precipitation of water out of the atmosphere. The



1.

Grow a cover crop of legumes or a mixture of legumes and grasses, apply manure at the rate of 5 or more tons per acre, finely ground raw limestone at the rate of from 1 to 2 tons per acre, and finely pulverized phosphate rock at the rate of 1000 pounds per acre.

moisture factor is important, and must be just right if humus manufacture in the soil is to succeed. It should not be attempted in regions where sufficient water is not available in the form of rain or irrigation water. The rate of composting will vary also with the temperature, and will proceed most rapidly when aeration, moisture, and temperature all are optimum for the organisms of decomposition.

Soil Organisms Convert Organic Matter into Humus

As soon as the organic materials have been worked into the soil and to the extent that environmental conditions are favorable, decomposition begins. The soil organisms secrete digestive enzymes which digest the carbohydrates: sugars, starches, celluloses, and lignins; the proteins; and the fats in the soil in much the same way as the digestive juices in the intestinal tract of an animal break these substances into simpler water-soluble compounds. The composting process begins slowly but increases rapidly just like a fire which consumes a brush pile or other organic matter.

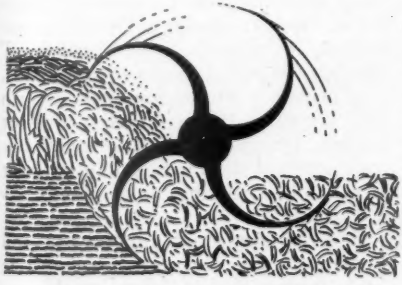
The Soil Cannot Make Humus and Grow a Crop at Same Time

During the time the soil organisms are consuming the organic matter in the soil, they often use the available plant nutrients for their own use. It is for this reason that a soil cannot grow a crop at the same time humus is being made in it. The soil will invariably give preference to the making of humus.

The time required for the complete transformation of raw organic matter into humus depends upon the nature of the soil, the amount of organic matter involved, and the conditions which favor the activity of the soil organisms. Any farmer can, by digging into the soil, determine how the decomposition is progressing, and when it is complete. This is no more difficult than checking a baking potato or a fowl in the oven by the housewife. Some kinds of plant material will break down more rapidly than others. Cellulose breaks down more rapidly than lignin. Leguminous plants break down much more rapidly than the straw of wheat and other grains. Accordingly leguminous cover crops lend themselves especially well to the sheet composting method of fertilization.

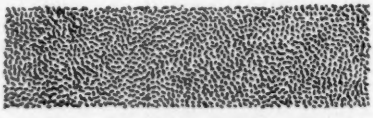
Crop May be Planted when Composting nears Completion

When the organic matter has been more or less completely converted into humus, as shown in Fig. 3, the crop may be planted. With some crops, as Indian corn, the seeds may be planted before the sheet composting process is entirely complete because the corn kernel contains sufficient food to feed the corn seedling for two weeks or more. But humus formation in the soil should be completed by the time the fibrous roots develop from the base of the young plant and reach out for nutrients for the growing corn plants.



2.

Work the cover crop and the other materials added into the surface layer of the soil. It is necessary to keep the organic matter near enough the surface to enable the soil organisms to get oxygen from the air.



3.

In the soil the organic matter is converted into compost and finally humus by the soil organisms.

PLATE A

Photo by Herbert Clarence White

Trees Go Wild in "Crazy Man's" Orchard

The Story of an English Walnut Tree at the Biological Research Farms, Paradise, California

By HERBERT CLARENCE WHITE

WHETHER there is even a remote relationship between "nut" trees and "crazy" men and women, we shall probably never know. But to all outward appearances something spectacular—something even bordering on the fantastic is happening to those trees in our orchard that were given an "organic treatment" last summer.

This is especially true with regard to the walnut trees—or should I say "*tree*"—for with all those lectures in Washington last summer, I had only fleeting glimpses of my ten acres up in Paradise Heights; and I never was able to get my job done on the farm.

On the occasion of one of these infrequent and all-too-short excursions to the home base, I decided to treat some of my English walnut trees with various types of organic mulches. As most of our *Organic Gardening* readers know, Herbert Clarence White is a confirmed, dyed-in-the-wool "mulcher." Protect the *surface* and you save ALL, has been my motto for years. With my friend Edith Hoffman of Fort Myers, Florida, I am convinced beyond the shadow of a doubt, that here is "The Missing Link in Soil Conservation."

This all-important life in the soil demands care and protection. The huge army of beneficent workers—these microscopic "giants" in the earth —must have proper housing facilities. Like ourselves and our domestic animals, they must have food and water in order to survive and do their job. An abundance of humus in the soil,

plus a "cover" over their tiny heads in the form of some kind of *mulch* is the answer to this problem.

Let me say right here and now—the "key" that unlocks the rich treasures of Nature's storehouse, the mighty weapons that hold disease in check, and combat the multitudinous and multifarious insect pests—are *simple* things. There is nothing complicated about *correct* agricultural procedures. Nature's laws are simple laws that even a child can understand and follow. Rich rewards await the person who is willing and humble enough to follow Nature's wonderful "lead", and to obey her simple but immutable laws.

But let's not become intoxicated with the exhuberance of our own (or anybody else's) verbosity! We were talking about such simple things as walnut trees and about our effort to try different kinds of mulches in the orchard. To start in this program of mulching, we hauled truck loads of straw, leaves, almond shells and alfalfa up from the rich Sacramento Valley. We had plenty of stones for our rock mulches right up here on the Ridge.

For our experiment we selected a walnut tree at random, and spread out a two-inch mulch of almond shells. Starting from about twelve inches from the trunk, we brought the mulch out to the drip-line of the branches. This necessitated about 500 square feet of cover. To our amazement, a whole ton of almond shells was used up in the performance of our task. I had intended to cover the almond shells with a heavy layer of straw; but before I could finish off that one little tree, I was unceremoniously yanked away from my job and whisked back to Washington for another series of "Soil and Health" lectures. And that put an end to all my plans for mulching for many a long month.

Before I venture any further with

PLATE B — Photo by Herbert Clarence White

A MIRACLE OF NEW GROWTH

Here is the mulched English Walnut tree as it looked on my return from Washington last October. In spite of frosty weather, a large portion of the leaves still remained on the tree—and they were still green. Notice the tremendous new terminal growth.

our story, let me warn all you "mulching fans" not to allow your straw, or your leaf-and-rock mulches to contact the trunk of your tree (young or old). I found one good organic gardening enthusiast up in Washington, who had piled up the leaves and stones around the trunks of his young fruit trees until they formed veritable pyramids —with the trees looking like the aftermath of an atom bomb—mushrooming out of the center of the pyramidal-shaped rock piles. In the case of young trees, I place a large tin can around the trunk, protecting the "bud" or graft from any contact with the organic or stone mulches. With adult trees I start my mulch about one foot from the trunk, and extend it out to the drip-line of the branches. This is important, for a number of very obvious reasons.

On my return from Seattle in early July for a second trailer-load of domesticated "Soilution" earthworms, I noted with considerable interest that the walnut tree that had received the almond shell mulch was busy throwing out new terminal growth. Nearly every branch had from 24 to 36 inches of new wood, while the unmulched trees throughout the orchard showed absolutely no signs of activity or new life. They were just barely holding their own. Every tree in the orchard, according to my helper, had received the same amount of water during my absence. (We use the "Alco" Sprinkler system instead of irrigation here in Paradise.) Therefore, the only variable factor which could make such a striking disparity in new growth was the almond shell mulch!

In addition to the fine new growth, this particular tree looked healthier—the foliage was heavier, the leaves

PLATE C Photo by Herbert Clarence White

"COMPARISONS ARE ODIOUS!"

But here is the companion tree that had no mulch or other organic treatment. The two pictures were taken within ten minutes of each other, and are self-explanatory. The leaves have all fallen from this tree. There is practically no new terminal growth. While the two trees compare favorably in size, there was only one-sixteenth as many saleable nuts under the unmulched tree.

were a richer, deeper green. The promise of a good nut crop was also more apparent, with clusters of from two to three nuts on each terminal branch, whereas on most of the trees there was only one.

Unfortunately, unfavorable weather conditions early in the season made prospects of a successful walnut harvest very dim in Paradise. Blight was running rampant in nearly every orchard—including my own. But here was a tree of outstanding health and vigor. In spite of adverse weather conditions, the ten-year-old was loaded with nuts, and props had to be used to hold up the heavily-laden branches.

In September, I was back in Paradise again for a few days. I was happy to see that the mulched tree was still throwing out new growth. It was positively fantastic when compared with its 149 fellow nut trees in the orchard —all of which hadn't seemed to grow an inch all summer.

It was early November before we finally wound up our lecture tour in the great Northwest and broke away from our activities in the "Evergreen State". It was then, and not until then that we were privileged to return home, and *stay home* long enough to harvest our apples and walnuts.

And what a sight for sore eyes greeted our return! The leaves on 149 walnut trees had turned brown and were beginning to fall. Only *one* nut tree—you've guessed it—the tree with the almond shell mulch, was standing out like a "green bay tree" in all its glory in the midst of its drab, crestfallen, partially defoliated fellows! It was apparently just as gloriously full of life as in the early summer.

There is a growing conviction on the part of many devotees of Organic Gardening that the mulched tree, or shrub, or vine has greater power to resist cold and frost damage than those not thus treated. Our experience with the nut trees confirms this in capital letters; for a month later, when all the other trees were completely denuded of leaf growth, this tree still held most of its leaves, and many of these were still green!

But, what about the crop? After all, the crucial test in all these Organic Gardening procedures lies in the ability of the tree or vine to produce at minimum cost marketable fruit of the very highest quality. I think all of us will agree that any experiment in orcharding or gardening would be a stark failure if it should produce *only* good-looking, frost-resistant leaves and lots of new terminal growth—and NO fruit.

As I write these lines, I am so excited, I had better drop my pen and try the typewriter! You won't believe it folks, but when we picked up the walnuts from under that mulched tree (and the grey squirrels had gotten their share of these extra large, extra quality nuts)—they nearly filled a huge 100-lb. "gunny-sack"—the equivalent in marketable nuts of any sixteen other trees in the orchard!

In Plate A you will see three sacks of walnuts. The bag of nuts on the right came from the ten-year-old mulched tree that went "wild". The two bags on the left contained walnuts that had been gathered from three full rows of nut trees with eleven trees to the row—thirty-three trees in all!

Maybe my figuring is bad (I never liked arithmetic anyway). Maybe I need a new pair of glasses! But according to the indisputable proof provided by my trusty camera, this mulched tree bore 1600% *more* marketable fruit (or should I say nuts?) than any other tree in the orchard!

Now I hasten to assure you that this single, isolated experience doesn't prove a thing. As Leonard Wickenden so aptly says, "One swallow doesn't make a summer," nor do the wild antics of one nut tree that has been mulched by another "nut" with shells from still another, prove that you or I can ever again produce such a miracle as this, either in your back yard garden, or in my orchard.

Perhaps there was a hidden spring of mineral-rich water that broke loose last summer under that particular tree at the climatic and strategic mo-

ment when walnuts were in the making. Or perhaps all this was a mere "happenstance"—but friends, you all know what I really think—don't you?

And if all my pretty, young trees respond as favorably and as quickly to this simple mulching program as did my prize walnut tree, I shall no longer be the poverty-stricken man I wrote about last August—"standing in the need of prayer". For my nut crop alone will provide a gross income of approximately $3,500! And I have heard it said that figures don't lie. Here's hoping. And some sweet day in the not-too-distant future I hope to be able to say in all truth and sincerity—"Nuts to you—from Paradise!"

The Soil and Health Foundation

Members of the Soil and Health Foundation will be pleased to learn that amazing progress is being made in the better understanding of the intimate relationship between soil and health. For a hundred years the adherents of artificial chemical fertilizers in the growing of our food plants have recommended more and more pounds of sodium nitrate, ammonium sulphate, and other highly soluble artificial chemical fertilizers. In 1943 Professor J. K. Wilson, Professor of Agronomy at Cornell University pointed out that nitrates in the food of animals may be reduced to nitrites and that these are likely to cause poisoning through combination with the hemoglobin of the blood. More recently, Professor Wilson presented data on green vegetables grown at Ithaca, N. Y. showing that vegetables, especially those that are eaten as "greens" may be so heavily loaded with nitrates as to be definitely toxic. Expressed in parts per million, beets were found to have 1,333, broccoli from 785 to 3,846, cabbage 2,222, cauliflower, 2000, celery 1,212, head lettuce 1,250, and rhubarb as much as 5,454. Prof. Wilson says,

> *"If it is assumed that 1 gram of potassium nitrate ingested at a single meal is toxic, it would be necessary to ingest only 3.9 ounces of rhubarb to get a toxic quantity of nitrate. If one uses the findings of other workers and makes similar calculations, about 2.3 ounces of spinach, turnips, or certain other vegetables would supply the toxic quantity. The present practice of applying large applications of nitrate of soda to crops in order to produce succulent material with a bright green color and to obtain heavier yields may be responsible in most cases for the high content of nitrate in these foods."*

The high nitrate content of foods grown in soils to which large amounts of soluble and inorganic nitrogen have been added, and the demonstration that these nitrates are toxic and may even be lethal to children emphasizes the need for carrying out the purposes of this Foundation. Excesses as well as deficiencies of other essential elements also have their effects on health.

The Soil and Health Foundation laboratory has been partially equipped and is now ready for a well-trained scientist to put it into operation. We urgently request all members who have not done so to renew their membership by sending in another contribution, large or small. We invite new members to share in this highly important work. It would be wonderful if someone would endow the laboratory's first scientist, much as a chair in a university is endowed.

Send contributions to the Secretary, 46 South West Street, Allentown, Pa.

Botany For The Gardener (17)

By DR. WILLIAM H. EYSTER

LICHENS—PLANT COOPERATIVES

LICHENS are not plants but are composed of plants, just as communities are not people but are made up of people. A lichen consists of a species of alga and a species of fungus living together in a most intimate relationship called a *symbiosis*. The algal cells possess chlorophyll and are thus capable of carrying on photosynthesis. This, as will be recalled, is the first and fundamental process in plant nutrition. The algal cells absorb water and carbon dioxide and, using the energy of sunlight, convert them into sugars and other carbohydrates. They thus serve in the lichen as the commissary department or kitchen. In most lichens the cells of the fungus form a protective covering over the algal cells and thus take care of the housing problem. Since the cells of the fungus lack chlorophyll, they must get their food from the algal cells. The algal cells might be compared to the farmers and gardeners of a community, while the fungous cells are to the lichen what all workers who do not produce their own foods are to the community. The internal structure of a lichen showing its algal and fungous constituents are shown in Fig. 42. A lichen represents the most remarkable symbiosis in the entire plant kingdom. Lichens never live as parasites on other plants, but may be epiphytic, i.e. live on the surface of another plant simply because they find a suitable habitat there.

The word "lichen" is of Greek origin and was used by Theophrastus, the father of Botany, in describing the superficial growth on the bark of olive trees. In the early days of botanical study, lichens referred to liverworts of the Marchantia type to be described in a later part of this work. Lichens were at first regarded as a kind of moss. In 1700, however, Tournefort, who first classified all members of the plant kingdom into genera, reserved the genus *Lichen* for all the cooperative or symbiotic structures which we now recognize as lichens.

Distribution of Lichens. Lichens are widely dispersed over the surface of the earth. They abound in the tropics, are widely distributed in the temperate zones, and become the dominant flora in the tundras of the high latitudes. They occur on bare rocks, on soil, on decaying wood, on the trunk, branches, and even leaves of trees, and on other plants. On the faces of shaded cliffs occur the crustose lichens which appear as greenish-white whitewash, on the trunks of trees they have the appearance of grayish-green scales which grow out from a common center, on the rocks at some elevation in the mountains they look like large, leath-

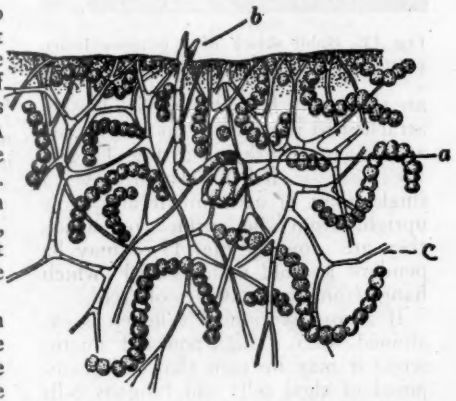


Fig. 42. A cross section of a thallus of the lichen, *Collema microphyllum* Ach, showing the bluegreen algae which look like strings of pearls and the colorless fungus mycelium indicated by *c*. (After Stahl).

ery thalluses which are hard and brittle when dry and soft and slippery when wet. "Old man's beard" which grows on practically every live oak in California is a large lichen which lives in the branches of the trees. Other lichens live on the forest and woodland floor, and may have brightly colored apothecia or fruiting structures. Anyone interested in these interesting plant cooperatives will find many of them while walking through a woodland, park, or mountain.

Structural Types of Lichens. Lichens are very different in structure from both their algal and fungous constituents when they grow separately. There are three structural types of lichens, as follows: (a) Crustose lichens grow as encrustations on rocks and other surfaces and are firmly attached even to the margins as shown in Fig. 43, (b) *thallose* or *foliose* lichens which

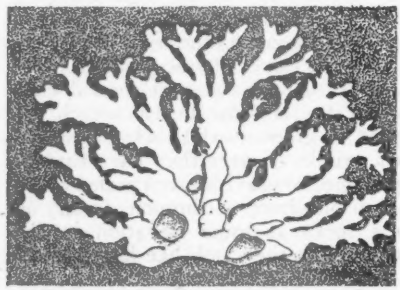


Fig. 43. Habit sketch of a crustose lichen growing on the surface of a stone.

are thallus- or leaf-like and are loosely attached to the surface on which they are growing, as shown in Fig. 44, and (c) *fruticose* lichens which have a single point of attachment and grow upright from the surface on which they are growing, Fig. 45 or may be pendant as "old man's beard" which hangs from the branches of trees.

If a cross-section of a lichen is examined with a high-powered microscope it may be seen that it is composed of algal cells and fungous cells variously arranged in different lichens.

The algae most commonly found in lichens belong to the Blue-green Algae and the Pleurococcus group of the Green Algae. The fungus constituent of most lichens belongs to the Ascomycetes or Sac Fungi. Only a few lichens are made up of an alga associated with a Basidiomycete or Basidium Fungus.

Reproduction. By far the most common method of reproduction of lichens is by the breaking up and distribution of the thallus by wind. Some lichens form small spherical bodies, called *soredia,* which are made up of some algal and some fungous cells. These appear as a fine powder on the surface of the thallus and are easily removed and scattered. The fungous constituent of each lichen produces fruiting bodies characteristic of the fungus when it lives by itself.

Lichens as Soil Formers. Because lichens can grow on bare rocks, on the faces of cliffs, and on other soilless surfaces, they may be regarded as the pioneers in soil building. They break down rock and prepare a soil in which plants can grow. A typical succession is something as follows: crustose li-

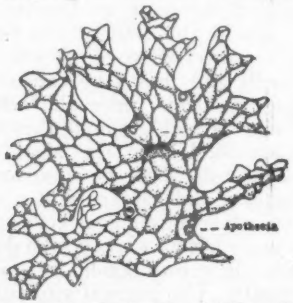


Fig. 44. Habit sketch of a thallose lichen, *Lobaria pulmonaria* commonly known as lungwort, with cupshaped apothecia (fruiting structures).

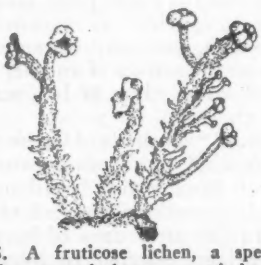


Fig. 45. A fruticose lichen, a species of *Cladonia* commonly known as reindeer moss. Reindeer moss is an important food plant for deer in the northern tundras.

chens, foliose lichens, mosses, ferns, and seed plants.

Lichens are the only plant formations that can survive extreme conditions of heat and cold. They grow in Polar regions where no other vegetation could obtain sustenance; they are to be found at great heights on mountains in all parts of the earth; and, on arid desert rocks they persist through long dry seasons, depending almost entirely on the night dews for the supply of moisture.

Lichens as Foods. Lichens are used as foods by such lowly animals as snails and insects and such higher animals as reindeer and man. *Cladonia rangifernia,* the well-known "reindeer moss", is the most important food lichen for reindeer and cattle.

Lichens contain neither starch nor cellulose, but lichenin which has long been utilized as a food substance. This substance is peculiarly abundant in "Iceland moss" (*Cetraria islandica*) which is illustrated in Fig. 46. It is collected during wet weather or at night when it is soft and is more easily loosened from the ground on which it grows. About three years are required for the plants to regenerate after an area has been harvested. The lichen is dried and reduced to a powder. When boiled it yields a jelly which forms the basis of various light and easily digested soups or other foods. It may also be made into bread or gruel. Other species of lichens have been used by various peoples at various times as foods, but space will permit only the mention of the desert lichen, *Lecanora esculenta,* supposed to be the manna of the Israelites, and still called "bread from heaven." This lichen grows abundantly on rocks and soil in North Africa and is eaten by the desert tribes. It is believed that the manna alluded to in the Bible in Exodus XVI is the sweet gum exuded from the tamarisk, while the manna mentioned in Numbers XI refers to the lichen. Although the nutritive value of this lichen is very low, it could be of great value in times of famine.

Other Uses of Lichens. Lichens have been used as sources of medicine and certain poisons. They are also used in tanning, brewing, and distilling. Various economically important dyes and pigments are extracted from lichens. The common litmus which is used in the chemical laboratory to determine whether a solution is acid or alkaline is a pigment extracted from a lichen. Certain lichens are used for making expensive perfumes, as "Mousse des Chenes" which is made from the lichen *Evernia prunastri.* In earlier times this lichen was also used in making a hair-powder which was believed to beautify and cleanse the hair by removing dandruff.

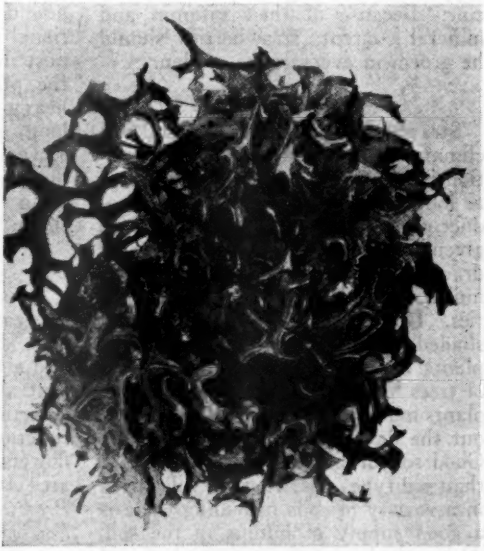
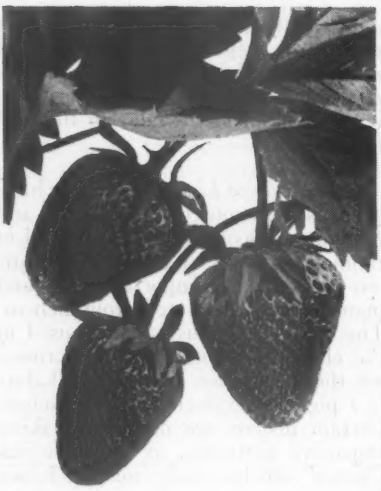


Fig. 46. ***Cetraria islandica,*** **commonly called Iceland moss is used by Icelanders as fodder for horses, oxen, cows, and pigs. It is also an important human food.**



How to Plant A STRAWBERRY PATCH

By DR. WILLIAM H. EYSTER

STRAWBERRIES are so rich in vitamin C that an ordinary serving contains more of this vitamin than a half cup of fresh orange juice. They contain appreciable amounts of fluorine and iodine as well as aluminum, copper, iron, manganese, silicon, and zinc. Because of their vitamin and mineral content, strawberries should be grown in every home garden.

Location and Soil Type

Strawberries are exacting in soil and climatic requirements. A good location is a definite asset which will last as long as the patch can be kept productive. Especial attention should be given to suitable soil, good water drainage, occurrence of frosts, suitable mulch, and adapted productive varieties. Do not plan your patch in a shaded part of your garden where the plants must compete with the roots of trees for nutrients. The strawberry plants must have full sunlight throughout the day and good air circulation. Good soil drainage is more important than soil type. Strawberries will thrive in a variety of soils providing there is a good supply of humus in the soil. Although they prefer a somewhat acid soil, the pH of the soil does not matter so much so long as there is sufficient humus in the soil. The humus acts as a buffer against soil reaction and insures vigorous, healthy, productive plants. It is best not to use a soil that has a sod until the sod has been completely composted. The most suitable soil type is a sandy loam.

How to Prepare the Soil

Prepare the soil as for any other crop, turning the cover crop in lightly. Then add a 2-inch layer of compost over the patch and work it into the top two or three inches of the soil. It will be well also to add pulverized phosphate rock at the rate of one pound for each 25 square feet. Additional amounts of finely ground compost may be added to the rows when the plants are set. Strawberries are heavy feeders, and have a relatively long growing season. Sufficient reserves must be stored in the plants during the growing season to enable them to set an abundant crop of fruit the following spring.

What Varieties to Plant

It is desirable to plant more than one variety in a patch, however small it is. This will insure cross pollination and a better set of fruits. It is important also to plant only the two-sexed varieties. These varieties have both functional stamens and pistils in the flowers. Some recommended varieties are *Aberdeen, Chesapeake, Howard Premier, Howard Supreme, Dorset, Fairfax, Midland,* and *Starbright.* Recommended fall-bearing strawberries are *Mastadon, Pan American, Green Mountain, Progressive, Streamliner, Majestic,* and *Rockhill.* Be sure that

Fig. 1. Well composted soil insures strong vigorous plants and heavy yields.

the varieties you select are adapted to your particular region.

When to Plant

The best time to start a new strawberry patch is in the early spring, just as soon as the soil conditions permit. If the soil contains a satisfactory supply of humus, this will be quite early spring.

How to Plant

In the home garden it is customary to use the hill system in planting. According to this method the plants are set 12 to 16 inches apart each way with four rows to a bed. In a new planting the runners should be removed regularly so that the mother plants become strong and robust. Before setting, the plants should be pruned, as illustrated in Fig. 1. Cut the roots back to four or five inches; the larger leaves, and especially all damaged ones, should be removed. The removal of the larger leaves reestablishes a proper root-top ratio and prevents the loss of an excessive amount of water through the leaves by transpiration (evaporation).

Particular attention should be given to the depth of planting. The crown of the plant should be kept even with the level of the soil—not lower and not higher. See Fig. 2. The roots should be spread out and completely covered, as illustrated in Fig. 3. Care should be exercised that none of the leaves are covered with soil. Firm the soil well about the roots so that air pockets in the soil are avoided. The importance of setting the plants exactly right cannot be emphasized too much.

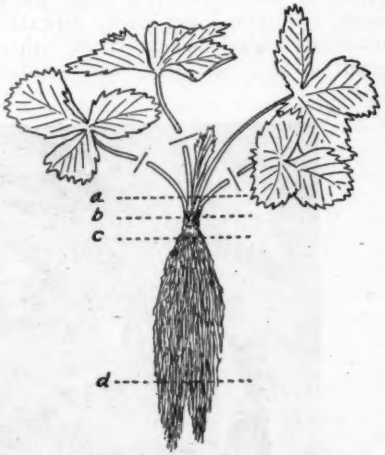


Fig. 2. Pruning of a plant before planting consists in cutting off all but one of the fully expanded leaves and cutting off the roots as indicated by the dotted line, *d*.

In setting the plants, the ground level should be at level indicated by dotted line *b*. If the ground level were at level *a*, the plants are set too deep; and if at level *c*, the plants are not set deep enough.

First Year Care

Weed growth must be prevented by clean but shallow cultivation, or by applying a suitable mulch. Deep cultivation will cut the feeder roots and greatly retard the growth of the plants. All flowers should be removed the first year to prevent fruit setting. This will insure vigorous plants and good runners which will produce the crop the following spring.

Mulching

Mulching is a good practice in the strawberry patch. Perhaps we should distinguish between *winter mulches* which prevent alternate freezing and thawing in the soil and protect the plants from wintery winds, and *summer mulches* which conserve soil moisture, control weeds, and serve as a source of humus for the soil. Winter mulches also retard the time of spring growth and flowering and thus tend to protect the crop from late spring frosts. Summer mulches prevent the splashing of soil on the ripening fruits and facilitate in other ways the gathering of the fruit.

The materials used for winter mulching should be free from weed seeds and should not pack. Suitable materials include wheat straw, other grain straws, salt hay, and similar plant materials. Summer mulches include such finer materials as ground leaves and other plant materials, sawdust, and compost. In no case should the finer summer mulches cover the crowns of the strawberry plants. Winter mulches should be applied just as freezing weather starts. In this way, the frequent damage resulting from early fall freezes can be avoided. Winter mulches should be spread over the entire strawberry patch to a depth of several inches, while the summer mulches should be limited to the spaces between the rows.

Stone Mulching

Strawberries are remarkably vigorous and productive in the stone vegetable garden on the Organic Farm. The spaces between the rows are covered with closely placed, native stones. These stones reduce space for the growth of weeds to a minimum, conserve moisture, prevent soil splashing on fruits, provide good soil drainage, and make the fruits available in wet weather. A stone mulched strawberry patch should be completely covered with a straw mulch to prevent early spring flowering. Otherwise the stones will absorb sun's heat and cause the plants to blossom so early that damage from frosts might follow.

Fig. 3. The strawberry patch can be made permanent by stone mulching the spaces between the rows and providing a suitable winter mulch of loose straw or hay.

If You Have No Modern Plumbing

By

DR. FLORENCE BASCOM-PHILLIPS, D. C., L. S. B.

I GREW up on an Iowa farm and almost no one in the country had modern plumbing facilities. Now many people living on farms do enjoy modern sanitary conveniences, but there are also many still who do not have access to the comforts which we in the city have learned to take for granted. It is for them that this article is written.

My interest in the organic method was fostered on our Iowa farm, where the earthworm population seemed inexhaustible and the gulls followed the plow in the spring to feast upon the juicy worms upturned, and also on a large Montana wheat ranch where I lived for ten years. The organic method particularly attracted me as it relates to farming on a large scale as set forth in the story of Mr. Oliver's grandfather's compost pit full of earthworms where the barnyard manures were continually kept composting.

My suggestion is that even the tenant farmer can arrange such a pit and place his outdoor toilet near enough to the pit so that a cement chute from the back of the toilet will provide an easy method of cleaning out a cement pit underneath the toilet seat. By placing a small quantity of straw or other vegetable "bedding" material in the toilet pit, having the bottom of the pit even with the edge of the chute, a small door could be raised and the entire mass removed each day, just as regularly as the barns are cleaned. Where there is running water, it could easily be cleaned with a hose and where there are not those facilities, it would be simple to wash it out with more primitive methods. The residue raked into the pit would compost with the animal manures for spreading on the farm crops, and if well inhabited with earthworms would be no detriment to the soil.

There is only one precaution here. The family occupying the premises better be careful not to take drugs which will kill the earthworm population in the pit. If we are going to be true organic gardeners, we will have to return to the simple herbs instead of drugs, and every organic gardener and farmer should plan to raise a number of the most valuable herbs—but that is another story.

The plan outlined here would do away with one of the most nauseating features of much of the country living still extant throughout our land. Moreover, it might encourage those whose incomes will not provide a budget sufficient to start organic farm living on a completely modern style to attempt it years sooner; because of having found a sanitary solution to that horror which breeds flies and disease and frequently pollutes the water supply on poorly planned farmsteads.

Such an outdoor toilet as I have described, might be made large enough to include wash pan, sink and towel and provide a place where the farm hands could clean up before entering the house, even if the house is equipped with modern toilet facilities. No woman likes cleaning timothy heads, straw and manure off the bathroom floor, and given suitable quarters in which to do it, there is no reason why farm men could not clean up before coming into the house just as well as city men, who do dirty work, do. In cold climates, if the outdoor toilet is used as a washroom, a stove would have to be added. Knowing the men folks would come into the house with no barnyard odor would lure many a woman to a farmstead sooner. Where toilet facilities are available in the house, this toilet might be included in the barn itself, providing a place to change clothes and clean up.

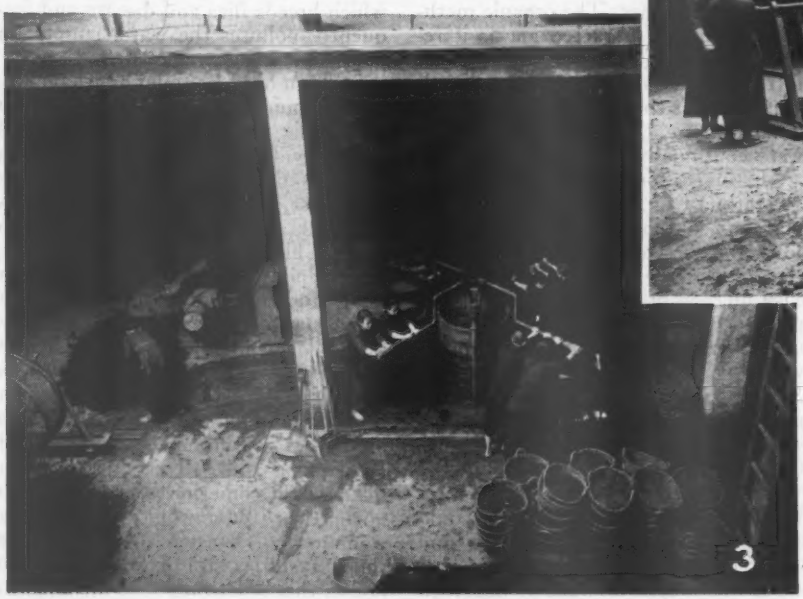
ORGANIC FERTILIZERS - *Made in hi*

by G. H. EARP-THOMAS Hampton, N. J.

AMERICAN people have always been very extravagant, discarding anything that got in their way, particularly in the form of waste organic matter, for which they are now paying a heavy price in doctors and hospital fees. It is known that we must have thirty-two factors for good health and they should be in proper proportions. A deficiency of any one leads to illness. In fact today almost all animal foods are reinforced and drug stores are loaded with vitamins and hormones to supplement our food, which has now lost many of these valuable qualities, including some of the rare elements. They have gradually been used up in our soils.

For about forty-five years our Laboratory did research in feeds for animals and quickly found that, unless they were reinforced, particularly with minerals, in the early days the animals would not survive. It would be too long to go into the details of the various minerals missing in various sections of the country. However, they are pretty well known.

I fortunately came in contact in 1928 with a Japanese named Joske Komori who was very much interested in this work and studied in laborat particularly in the fact it wa to the soil the things took fr organic wastes. He sold ofital in New York to go Japan,



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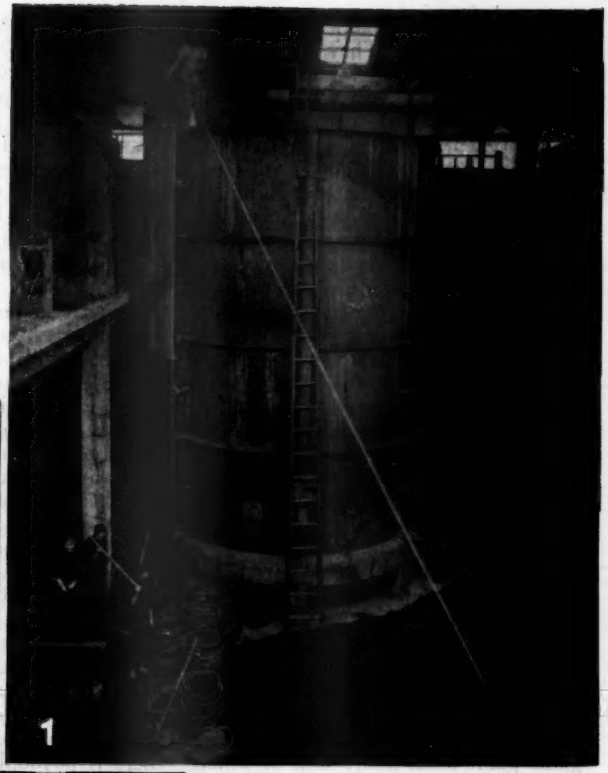

1. A ... digester in which raw organic matter is converted into ... by biological processes.

2. A ... sieve for sieving the compost after it comes from the ...

3. W... is pressed dry before running it through the diges...

reasons to help his country. He was very successful until the war stopped the operations. Since then I have received a communication from General MacArthur's headquarters that they wish to continue this work to improve the food resources in Japan. This work led to a number of foreign developments; one in particular in China at Hong Kong and other ones in Canton and Manila. It was very interesting in these early days to see how cheaply labor could be obtained to carry out the various processes essential in the decomposition by the use of bacteria of the organic wastes of Hong Kong. Women could be hired for nine cents a day and the pictures illustrate well the hard labor which was carried out. In one operation when garbage was excessively wet they would put it through a press by hand.

This operation in America is done by a Kuttskoff Press. They then loaded it in baskets and carried it up to the top of a Digester where bacteria are used to completely decompose this material by aerobic processes. In other countries this work is done with electric conveyors. As soon as the material was decomposed to a very fine loamy type of earth it was then sifted through rotary sifters as can be seen in the picture. These Chinese women, even though receiving but nine cents a day, look well fed and nourished and are not thin. They are husky, hard-working people and were very pleased for the opportunity to work in a scientific plant. The Chinese women even loaded up the boats with many hundred tons of this fine organic fertilizer. Some of it was shipped to Canton University where Professor Chin of the University used it to grow vegetables and fruits and he found that it reduced rickets in the children there, and he became so interested that he finally went into the production in China of this oxidized activated compost. Some of it was shipped to Manila and an English concern there put up a plant and manufactured many tons of organic plant food, many tons of which was made from ground up palm nuts, which were rich in nitrogen. The reports from this work finally led to several plants being operated in the United States.

Foods raised in these soils have a greater resistance to disease and a greater nutritional value to stock fed on them. Recently I had luncheon with a prominent banker, and he said he had spent many thousands of dollars in putting compost on his farm, since his first interview with me, and he was now ready to report that the bloom on the cattle was so noticeable that he was convinced that it should be adopted as a system, particularly in South America where he had financial interests. He said, just as Professor Albrecht of Missouri has stated, that the cattle would go to the fields where the compost was and eat the grass down low in preference to fields not so treated. It would seem that the cattle are superior in their taste glands for an analysis, than are the chemists of the country, for they could choose the food by their special senses, superior to the chemical laboratory.

I have been very gratified to observe that at last the interest in this country has become quite pronounced and there will be a large development in the near future of a fine organic plant food which will increase the tonnage produced per acre of ground and also the health of the community. This early work of the Japanese has now led to developments which are under way in England, Scotland, France, Iceland, Australia, Siam, Africa and in several localities in the United States. Once it is realized that organic matter can be made on a continuous flow basis with adequate machinery at a cost of not over $5 per ton and that it can be supplied with any rare elements that may be deficient to give it a proper balance, there is no doubt that it will have a profound influence in the production of food for the future. One drawback in the past to the production of compost has been the long period of time necessary for its decomposition in the natural way and the labor of turning at the proper time. Now mechanism can be used that is very efficient; large tonnage can be produced economically.

The very valuable work of Sir Albert Howard which ran concurrently with the work that we have been doing has blazed a path throughout the world for the betterment of mankind. Your magazine is doing a great service in this newer scientific development of complete balanced food.

LEAVES

Leaves are valuable fertilizer material, since they are rich in minerals. Even the needles of pines contain goodly amounts of calcium, silica, and potash. Leaves of maples, oaks, elms, chestnuts, etc. have, as a rule, twice as much mineral content as manure pound for pound; but since they are lacking in nitrogen they had best be used as part of the compost or mixed with nitrogenous material such as manure, hoof and horn meal, fresh or bagged poultry manure, dried blood, or as a basis for potting mixtures. Dried leaves have an acid reaction, pine needles are only slightly more acid (pH 4.0). This makes leaf mold especially valuable for acid-loving plants, such as azaleas, rhododendrons, camellias, begonias, epiphyllums, fuchsias, roses, and wild flowers of the forest. The mineral content of a maple leaf is over 6 per cent, that of pine needles about 2.5 per cent. About one tenth of this is potash and one twentieth phosphorus. When used as mulching material leaves gradually decay and enrich the soil with these plant nutrients. Since tree roots reach much deeper into the subsoil, tree leaves are a most valuable source of rare or so-called trace minerals which the roots bring up from below. As leaves decay readily in the ground, they should never be burned but used for mulching of shrubs, fruit trees, berries and incorporated as part of the plant matter in the compost heap. Undecayed leaves from the woods are more valuable than broken-down humus from the woods, as experiments at the John Innes Institute at Merton, England showed; this is only natural, because the leaves contain plant nutrients while humus underneath may be leached out. The superstition that oak leaves are poisonous to the ground is not substantiated by any of the experiments that have been conducted. Despite the relatively high calcium content of most leaves, calcium must be added to leaf compost in order to balance the acidity and produce a neutral reaction for garden vegetables and the majority of the flowering annuals.

It is commonly thought that leaves contain little nitrogen, but fresh leaves are by no means lacking it. When dropped by the trees in fall, the nitrogen has partly been used up by the tree, but there is still a remainder which will benefit the soil and the plants in the end.

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LEAVES—In the Compost Heap (How to Use)

Leaves should not be used as the exclusive green material in making compost. They should be mixed with weeds, etc. so as not to pack and impede the aeration. Another way is to put down about five inches of other green matter and about one inch of leaves on top of it. This makes the total of six inches of green matter. We always gather leaves in the fall and let them lay in a pile a few months before transferring them to the compost heap.

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DISEASED LEAVES

They may be used provided they are thoroughly composted. Temperatures of 150° will kill off disease organisms. Be sure that they get into the middle of the compost heap where the heat is the highest. Introducing domesticated earthworms into the heap after the heating goes down will help also. Anything that goes through their digestive tract comes out disease-free.

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HOW TO COLLECT

A satisfactory method of collecting and storing leaves in a minimum space is to rake them on piles and pack them in burlap bags or other containers. It is surprising how many leaves can be packed in a limited space.

LEAVES (Composting without Manure)

Where it is desired to compost leaves without manure, pile them in alternate layers with topsoil—three inches of leaves and a thin sprinkling of about ¼" of soil. Pile your heap about three feet high. It would be better if you can mix your leaves with weeds, grass clippings, etc.—half and half, thoroughly mixed together. You would also get quicker results if you can introduce earthworms into this kind of heap. Then it might take only six months, otherwise one year. Apply plenty of water.

On our farm we make large amounts of compost by mixing leaves and corncobs ground up in an ensilage cutter. Leaves alone would tend to pack. We have made compost by this method without manure, soil or lime, by introducing a large quantity of earthworms as soon as the heating subsides which is in about six weeks. The earthworms will enrich this material with their manure. If weeds are available, a mixture of the three materials would be better. We do not turn the material and it should compost in about six to eight months depending on the season.

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DECAYING LEAVES UNDER ROCKS

A quick way of decaying leaves is to place them in the garden where they are to be used and cover them with rocks. When they are decayed, the rocks can be removed and the process repeated elsewhere. Earthworms like to work under rocks and the action of decay is expedited. This method is excellent under fruit trees.

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DO LEAVES CONTAIN NUTRIENTS?

Very much so. Bulletin No. 92 of the Clemson Agricultural College of Clemson, South Carolina, shows that forest leaves which they tested contained .76% of nitrogen, .26% of phosphorus and .42% of potash per ton of leaves. Besides this, leaves are known to contain rare trace elements and are wonderful for the organic matter which they contain which enables them to absorb and hold more water and improve the physical condition of the soil where they are used.

According to another study apple leaves when fully mature and before falling may contain nearly 3% nitrogen, 6% phosphorus and 12% potash.

Bulletin 395 of the Massachusetts Agricultural Experiment Station contained a study showing that mixed leaves contained .60% nitrogen, .17% phosphoric acid, .13% potash, 1.28% calcium oxide, and .31% magnesium oxide.

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LEAVES AS MULCH

For purposes of mulching leaves need not be aged before using. Fresh leaves may be used.

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OAK LEAVES

Oak leaves are excellent plant materials for the compost heap. They are surprisingly rich in nitrogen and contain approximately 0.8 per cent nitrogen or as much as dry manure and more than an equal bulk of milk. In addition to nitrogen the Oak leaves contain many of the other elements that are essential to plant nutrition.

The superstition that Oak leaves are poisonous to the ground is not substantiated by any of the experiments that have been conducted. Some plants, like Camellias, berries of all kinds, and rhododendrons, prefer or actually demand acid soils so that little or no lime need be added to heaps which are intended for such plants.

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WALNUT LEAVES

It is known that the roots of the Walnut Tree as well as the husks of the walnuts themselves give off a toxic substance, which is poisonous to other

fruit trees in the vicinity as well as to some grain crops and tomatoes. It is possible that the leaves may contain some of this substance as they are very oily. It might, therefore, be advisable not to use Walnut Tree leaves in compost heaps until they have been weathered.

Walnut leaves contain a considerable amount of tannic acid, and should be put in piles and allowed to weather for a year or two or long enough to permit the tannic acid to leach out before they are used in the compost heap. After the tannic acid has been removed, the walnut leaves are excellent composting materials.

We have taken up the matter of walnut leaves with some specialists in the Department of Agriculture and the evidence seems to be that they are not dangerous or poisonous. In fact, some crops prospered especially under walnut trees.

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EUCALYPTUS LEAVES

The leaves and bark of Eucalyptus contain Oil of Eucalyptus which makes it undesirable to use them directly as a mulch. Before composting, they should be exposed to the weather until most of the oil has disappeared. Then the leaves and bark can be used in the compost heap the same as other leaves. One should go easy about using eucalyptus leaves in the compost heap. Some burn them and use the ashes.

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KINDS OF LEAVES

All kinds of leaves are valuable for making compost—birch, elm, maple, etc.

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GRINDING LEAVES

A few years ago I experimented with the grinding up of leaves in a hammermill and ground the leaves up so fine, in an instantaneous process that they could safely be used as an organic fertilizer to be applied at once to the soil. What had once taken two years could now be done in two minutes. Of course, a hammermill costs a few hundred dollars so that this method would be practical only for nurserymen and large estates. If the leaves are not dry when running through a hammermill, mix some straw with them. A hammermill is standard equipment on the average-sized farm and is used to grind up wheat, corn and other materials for feeding to the stock. However, since the average gardener would not want to invest in such an expensive piece of equipment, I began to search for a simplier method and have developed one this autumn.

In this method it is of the utmost importance that the leaves be thoroughly dry. They must be gathered and stored in a place under cover. In a cellar they will dry sufficiently in about two days. To test whether the leaves are ready, crumble a few of them by hand. If they crumble nicely you are ready to begin. Incidentally it is surprising how easy it is to crumble goodly quantities of leaves with the hands, without the aid of any equipment whatever. By wearing gloves greater pressure can be applied. If your requirements are not too great, try it first by hand and see how fine you can disintegrate the dry leaves. Perhaps you will not have to go to the trouble of making the screens that will now be described.

As I have stated above it is of the utmost importance to let the leaves dry thoroughly. Perhaps, to be sure, you can let them dry for an extra day or two. You are now ready. Make a screen in a frame approximately two by three feet, using ½ inch screen wire sold in any hardware store. Its trade name is hardware cloth, ½" size. The first operation is to force the leaves through this screen, using your hand, working it back and forth and with gentle pressure forcing the material through. Wear gloves if possible. You then screen this product through your second frame which is made with a ¼" size screen, so that the product comes out a little finer. You will find it more difficult to procure the ⅛" screening for the last

frame, so a household flour sieve can be used. You can make a fourth screen out of mosquito wire screening if you want the product to be extra fine. It is suggested that gloves be worn for ease of working the material through. There are variations to this equipment which the intelligent gardener can think up to suit his own situation, and the equipment is most inexpensive.

If it is desired to get the leaf particles even still finer, it can be put through a household coffee grinder, or a hand grain grinder that can be purchased for perhaps five or six dollars from Sears Roebuck, or Montgomery-Ward. They also handle a cheaper, smaller model hammermill that sells for about sixty dollars, without motor.

This finely ground material is ideal for lawn, in shrub beds and for the vegetable garden. Work it in the upper four inches of soil, mixing it thoroughly with the soil.

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POWER MOWER GRINDER

One of our readers piled leaves on lawn in shallow piles and went over it with a power mower, cutting it up pretty fine.

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PLOWING UNDER LEAVES

Q. Is it advisable to spread the leaves about 4 inches and plow them under?

A. You can do that, but add a sprinkling of ground limestone to the leaves to counteract acid tendency. Also be sure you do not plant anything on this spot until the leaves are pretty much decayed, otherwise there may be poor yields on such a crop.

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DO LEAVES ACIDIFY?

Yes. They tend to. Therefore if used in the compost heap; use extra ground limestone. Another way to counteract such acidity is to place the manure type earthworm in with the leaves. Their manure will help to reduce the acidity.

In a study made of the forest litter under various kind of trees the following list shows the condition of acidity in each case. The lower the pH the greater the acidity. The neutral point is pH 7.0. Above that it gets more and more alkaline:

Pitch pine	pH 3.75
scrub pine	pH 3.82
white pine	pH 4.24
scarlet oak	pH 4.50
beech	pH 5.08
sycamore	pH 4.70
sassafras	pH 4.96
white oak	pH 4.40
black oak	pH 4.79
red cedar	pH 4.89
red oak	pH 4.89
sugar maple	pH 4.30
red maple	pH 4.70
yellow poplar	pH 5.25
staghorn sumac	pH 4.60
black locust	pH 5.90
dogwood	pH 5.12
black walnut	pH 4.15
horse chestnut	pH 5.17

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SEND FOR FREE BOOKLETS Write to Organic Gardening, Dept. Q., Emmaus, Pa. We will be glad to send you 25 or 50 booklets. State the amount you want.

A Modern Easter Arrangement

Rhythmically serene composition is easily achieved with calla lilies and a Madonna figure.

The simplicity of the lilies holds great charm with a strong feeling of Easter.

The tilt of the Madonna figure is a perfect balance to the leaning heavy leaves and lilies. The use of graduating sizes of lilies helps the composition.

The large callas are kept in place by an iron pin point holder.

Arranged by LIBBIE C. RAPOPORT
Conducted by ANNA A. RODALE

Phlox subulata and Iberis

Dwarf Phlox

By E. I. WILDE

IN late April and May, the dwarf mat-forming perennial phlox, on slopes and embankments, literally cover their foliage with color for the enjoyment of the motorist and gardener. To most people it is just a pretty dwarf plant but to the gardener, it is a variety of *Phlox subulata* or *Moss Phlox*. Few, however, realize that there are many species of dwarf phlox, all native to the United States, which are worthy of a place in the flower garden. There are our native Pennsylvania species, *ovata* and *divaricata*, which are not as well known as their neighbor, *subulata*, and about eight acceptable rock garden species of the central and western United States which have been grown in the east by only a few.

Success with most of these plants depends upon perfect drainage, full sun, and a not-too-rich soil, an environment which they enjoy fully in their native habitat of the mountainous and arid regions. The eastern species will grow well in a heavy soil although they enjoy a more sandy soil; whereas most of the western forms insist upon a sandy or gravelly soil and one, a moraine where there is a constant underground water supply with perfect drainage. *P. adsurgens* is the exception to sun requirement, it enjoys partial shade and is found growing naturally at the edge of woodlands.

Another attribute of the native Pennsylvania species is hardiness and when they are established, they will endure with the minimum of attention —no coddling necessary. They excel as ground covers because their prostrate stems form a solid mass of foliage which remains green the entire summer. They are propagated easily by cuttings, taken in early summer or by hand layering by scattering sand over the prostrate stems, or by seeding, when preservation of color is not the objective. The plants should be set 12-24 inches apart, depending upon the rapidity of growth of the variety and the immediate effect.

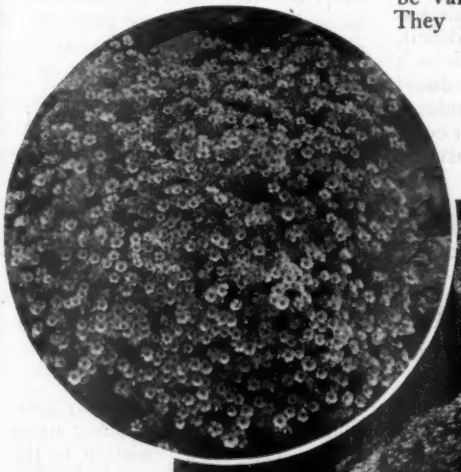
The more rapidly growing varieties of *P. subulata* such as *rosea, lilacina, atro-lilacina, Apple Blossom, atro-purpurea* and *alba* (the first two being much more vigorous than the others) are valued for their bold mass color effects, primarily on slopes or for naturalizing. Most of the newer varieties, however, are more compact in

Phlox nivalis sylvestris

growth habit and not too well known. They are more congenial in a small border or rock garden. A select list of varieties in this classification would be *Crimson Beauty* and *Brilliant*, cyclamen red; *Sensation, Emerald Cushion* and *Vivid*, bright rose; *Blue Hills* and *Geo. M. West*, lavender blue; *Fairy*, lilac mauve; and *May Snow* and *Snowhite*, white. The varieties *Vivid, Fairy* and *May Snow* are small compact plants which are unexcelled for any small pockets in a rock garden.

Another Pennsylvania species, *nivalis*, which is very much like *subulata* and considered by many botanists as a variety of it, is the progenitor of the garden subjects *Camla*-pink, *Camla*-white and *sylvestris*-rosy red. All grow to a height of 8 inches and remain tidy neat plants because they do not creep and spread rapidly.

Mention should be made of a few western species which some day may be valuable to the eastern gardener. They are *P. multiflora, condensata, hoodi, bryoides, bifida, douglasi* and *diffusa*. All would make excellent rock garden subjects for those who enjoy growing the unusual and finicky plants.



Creeping phlox. Phlox subulata—Morning Star.

Phlox divaricata—Common early blue phlox.

Phlox divaricata is a slender upright growing plant which is valuable for naturalizing, large rock gardens, and interplanting with tulips. The large lavender flowers are produced in small terminal clusters which contrast with the target flower of the tulip. There are two varieties; *Laphami* with a more intense color than the species and one that is white. *P. ovata* grows 1 to 2 feet high at high elevations and is recommended for natural planting.

The annual phlox of Texas, derivatives of *P. drummondi,* have been sadly neglected by present day gardeners. This species has given rise to dozens of forms varying in stature, color, shape and size of flower. The large flowered varieties are suggested when the maximum display is desired. These can be secured in separate colors, red, salmon, pink, white, and buff but no clear yellow as yet. There are two distinct groups, the taller 12-18 inches and the dwarf *nana compacta*) 6-12 inches. Of course the growth of the former is slender with insufficient foliage to make even a background for the flower, much less cover the soil. In spite of this deficit, however, the plant is invaluable as a filler in a perennial bed. The dwarf phlox, on the other hand, produces some of the most intriguing color combinations with brilliancy that just has to be seen before it is believed. Most of the colors are tints. A new annual phlox has been developed by doubling the chromosone number with the use of colchicine. Two of the resulting creations have been recently introduced as *Tetra Red* and *Tetra Salmon.* They are much sturdier in growth with larger and more abundant leaves than the parent; the individual flower and flower clusters remain the same although of better substance.

The annual phlox is of the easiest culture and this fact, together with the profusion and long season of bloom, explains its popularity. It blooms all summer and until frost, if stock and conditions are good. It needs a warm sunny place and will grow even in poor soil but only will attain its maximum perfection in a good soil and if planted 12 inches apart. Seeds usually are sown in the open as soon as the weather is settled. If the soil is poor and dry, the plants usually cease blooming by midsummer, but if plant food and moisture are abundant they may be expected to remain in boom until late autumn. To secure this result most perfectly, the old flower clusters should be removed; the plant is an end bloomer and when the terminal flower cluster has matured, the other shoots continue the growth and thereby provide a succession of bloom.

COMMERCIAL COMPOST IS HERE

February 25, 1949

Mr. Joseph Frazer of the Kaiser-Frazer Company has recently gone into the business of manufacturing a composted organic fertilizer using various vegetable wastes, sludge, city wastes, etc. At a reception to the press announcing this breath-taking development, Mr. Frazer said that commercial fertilizers are ruining our soil and our health. The new product is decomposed in about five or six days time in a large digester by means of bacteria. At present Mr. Frazer has built a plant at Mt. Wolf, Pa., which is now turning out this product. It is the aim of this new company to have manufacturing plants and to issue licenses to people all over the country.

LOUIS BROMFIELD AND THE INEXHAUSTIBLE MINE

By LEONARD WICKENDEN
Author of
Make Friends With the Land

SO greatly did I enjoy Louis Bromfield's *Pleasant Valley* that I bought a copy of *Malabar Farm* on the day of publication. I found it somewhat self-contradictory but absorbingly interesting and altogether delightful and exciting reading. If you find that a contradiction in terms, blame the book —not me. That is the kind of book it it. As the bewildered but happy reader progresses from page to page, it sometimes seems to him that a statement he has just read is a flat contradiction of one that he read only a couple of minutes before. But Louis Bromfield's easy, friendly style which conveys so clearly the charm of his personality, his tremendous energy and his devotion to the land, carries the reader along to the last page and makes him close the book with an indulgent grin and a feeling of regret that there are not a few more chapters to make him even dizzier with confusion.

This, however, is probably carping criticism of minor faults which the generous reader will overlook in his gratitude for the book as a whole. There is much in it to please the organiculturist, but much to exasperate him. The chemiculturist will also find support for some of his cherished doctrines, but on the whole he comes off a poor second. I foresee, however, that in debates on the subject, *Malabar Farm* will be much quoted against the organiculturist, so the support which is given to the use of chemical fertilizers calls for careful examination.

It is no easy matter to sum up an argument so diffuse and wandering as Louis Bromfield's, but I think a fair summation would run about as follows: Chemical fertilizers in the absence of ample organic matter to render them available are valueless, but in the presence of a high organic content they are valuable provided they are used in small quantities—about 250 lb. per acre. Used in large quantities, they can be harmful, but the higher the content of organic matter the less dangerous do they become.

Let us examine that statement and try to follow the curious logic by which Mr. Bromfield arrived at these conclusions. The statement that chemical fertilizers need abundant organic matter to render them available is a little surprising and contrary to the usual claim that much of their value lies in the fact that they are "readily available" and give "quick results". Mr. Bromfield, however, is emphatic on the point and repeats the statement over and over again. Here are a few quotations:

P. 126 "... crops like corn and cotton are constantly ... burning up the organic content without which even commercial fertilizer becomes virtually unavailable and useless."

P. 276 "Chemical fertilizers will be of very little immediate or even ultimate value upon soils virtually devoid of organic material."

P. 293 "Of course, all chemical fertilizer ... used upon cement-like soils devoid of organic matter ... will be of little use and can actually cause damage by the "burning out" of plants."

An abundance of organic matter could scarcely be provided with less than 10 tons manure or compost per acre, but such a quantity would provide 8 times as much potash, 8 times as much nitrogen and twice as much phosphorus as 250 lb. of 5-10-5 fertilizer. Even if we cut the manure to 5 tons per acre, we are still ahead on mineral matter. Further than this, however, Mr. Bromfield states over and over again that his soil and subsoil are naturally rich in minerals. On Page 53 he tells us that the soil is light but minerally rich; on Page 109

he refers to the deep fertility of the rich subsoil; on Page 132, he states that the subsoil is not only rich in native mineral content but is well-balanced with regard to trace elements; on Page 137 he reports an incident in which a woodchuck dug a hole, thereby bringing up subsoil to the surface which was so good a fertilizer that it grew better and more vigorous crops than the surrounding topsoil; and on Page 154 he comes right out and says that when he bought the property there lay just under the surface a mine of "thousands of dollars of virtually inexhaustible mineral fertilizer."

Then, on Page 279, we come to a description of the conversion of barren fields into fertile land in what Mr. Bromfield calls "the lower fields of the Bailey Place". In this soil, he tells us, there was "no organic material whatever." It had never been limed and was "a kind of cement". He reminds us once again, however, that the subsoil was "fantastically fertile" and that the "soil was minerally far richer than we believed". So they went to work, spread two tons to the acre of limestone and then a mine of manure which took nearly two years to get out of the barn and barnyard. They helped things along by seeding a mixture of legumes for a crop of green manure.

The results were miraculous. No-one, he says, was more astonished than they were by the extraordinary jump in production *within so short a period.* (The italics are mine, but please note those five words carefully and tuck them away in your mind for future reference.) He then proceeds to explain these marvellous results by the supposition that the liming, the content of water and the intensive application of organic matter had probably released about three years of chemical fertilizer applied by his predecessor.

What do you think of that explanation? Do you find the theory convincing? Here he had a piece of land lying in a valley and thus receiving much of the rain-fall draining from the hills. He says that the whole area was a network of gullies, ranging in depth from a few inches to six or more feet. Yet he tries to persuade himself and us that the wonderful recovery of the soil was due to the liberation of chemical fertilizers, largely soluble, which had been added to the soil before he ever bought the farm. He ignores the inexhaustible mine of minerals which, by his own admission, had existed for centuries in the soil and subsoil; he ignores the quantities of minerals contained in the manure which had been spread over the land; he ignores the minerals brought from the lower subsoil by the roots of the legumes he grew; and he attributes the miracle to the chemical fertilizers almost all of which had surely been washed away down the gullies long before he ever set foot on the place. Surely, his argument is one of the most inconsequential that has ever appeared in print.

Having demonstrated the miraculous effect of feeding exhausted soil with animal manures, Mr. Bromfield writes as follows:

"The fanatic advocates of the organic-material school will tell you that worn out depleted soil can be restored without the use of any chemical fertilizer, and to some extent this is true." Well, now, what do you think of that? After telling us that "cement-like" soil which would not grow more than ten bushels of corn to the acre could be made (solely by the addition of green and barnyard manure) to yield from 60 to 90 bushels per acre. Mr. Bromfield admits that the fanatic advocates are "to some extent" speaking the truth when they say that what he *has* done *can* be done. To some extent, indeed! A yield of 90 bushels of corn to the acre is not far short of three times the national average. How much further could he reasonably expect to go in restoring fertility to worn-out land?

He goes on to say that the fanatic advocates fall into error when they assert that vegetation can produce "out of the air" quantities of calcium, potassium, phosphorus and trace elements. How true! But when *do* they say such a thing? I have read a good

deal of literature on organiculture in recent years and have discussed the subject with many of those whom Mr. Bromfield classes as fanatics, but never yet have I encountered anyone who maintains that vegetation can pull mineral matter out of the air, and I never expect to encounter any such person outside a mental hospital.

We do assert, however, that given a fair chance vegetation *can* obtain these minerals from what Mr. Bromfield calls the "virtually inexhaustible" mine of fertilizers in the subsoil, and never have I read a more striking proof of the validity of that assertion than in the account of the restoration of the lower fields of the Bailey farm by one Louis Bromfield. But he complains that this process is too slow! Remember those italics? Remember how astonished he and his associates were at the extraordinary jump in production "within so short a period"?

What, then, is this quick and practical method by which Mr. Bromfield suggests that the farmer should restore his exhausted soil? Here it is: he should grow green manures and to make them grow vigorously he should first add chemical fertilizers to his soil. At that point, I confess I put down his book, held my bewildered head in my hands and groaned. We are first assured, over and over again, that chemical fertilizers are useless and can "actually cause damage" upon soils poor in organic content, yet now we are told that to *restore* organic matter through green manuring we must first add chemical fertilizers.

Says the author: "It is a kind of complex pattern, circular in design." Louis, you said it! Complex is right, and as for circular no word could be more apt. You have your readers despairingly running round in circles, trying in vain to keep up with you.

U FOR ULCERS—FOOD DOES IT

For the past ten years, Dr. Garnett Cheney of Stanford University's School of Medicine has been studying an anti-ulcer factor he tentatively calls vitamin U (Time, Jan. 1, 1945). Tests on patients have been encouraging; their ulcers got better when Dr. Cheney fed them on foods containing vitamin U, but he could not prove that U did the trick.

Cabbage, Dr. Cheney found, contained a lot of vitamin U, and seemed to keep guinea pigs from getting ulcers. In *California Medicine,* he reported results of a five-month test on 13 patients. He gave them a quart of cabbage juice a day, squeezed out by a juice presser from fresh raw cabbage. They also got a fairly normal diet. They were given no regular doses of alkalis, and were allowed to smoke all they wanted. All their food was cooked; vitamin U is destroyed by cooking, and Cheney wanted his patients to get it only in the carefully measured cabbage juice, served a glass at a time, five times a day. Five of the patients had ulcers in the stomach, seven in the duodenum, one in both the stomach and the jejunum (part of the small intestine just below the duodenum). They all got better quickly, according to X-ray evidence. Average healing time was 10.4 days for the duodenal ulcers (compared with 37 days for a control group treated by milk, alkalis and the conventional bland diet), 7.3 days for the six stomach ulcers (compared with 42 days).

Vitamin U is also found in celery, unpasteurized milk, fresh greens, raw egg yolks, cereal grasses, certain animal and vegetable fats. Dr. Cheney says cautiously that his experiment is not final proof that vitamin U heals ulcers, but "indicates it may be the case."

—*Time,* January 24, 1949

Garden Calendar—April

THE NORTH

April is the month for action in the gardens of the North. Perennials which retreated to underground protection for the winter are sending forth aerial branches for the new growing season. The seeds of the annuals which remained dormant in the cold winter soil are beginning to respond to the warmth of the spring sun. The garden activity for April is quite naturally directed to the soil. Winter mulches should be removed gradually and carefully from perennial beds and borders, leaving the finer parts as food for the soil organisms.

As part of the preparation of the soil for planting, compost the soil heavily. Do not dig or turn the soil more than is absolutely necessary, and do not work in the soil when it is too wet. Cover your seeds with finely screened compost to insure good germination.

Flower Garden:—Give the perennial beds a good top dressing of compost to conserve moisture, control weeds, and enrich the soil. Divide and replant such perennials as delphinium, helenium, anemone, japonica, fall asters, ceratostigma, Shasta daisy, axaleamum, and chrysanthemum for vigorous growth and good blooms. Phlox and Michaelmas daisy should be divided, but only the outer ring should be used for the propagation of new plants.

As soon as the weather has settled, set out from the coldframes pansy, forget-me-not, Canterbury bell, aquilegia, foxglove, boltonia, Japanese lantern, and others. Such rampant growers as achillea, goldenglow, boltonia, Japanese lantern, and sedum should be weeded out to make room for new growth. You need not be too careful as it is impossible to eliminate them completely from the perennial bed.

Gladiolus plantings should begin late in April and be repeated at two week intervals until well into the summer. This will insure a continuous supply of these beautiful flowers. Give the iris plants a dressing of compost. Plant seeds of the annual hollyhocks now for August blooms. Petunia may be sown outdoors after the soil has been well raked and enriched with screened compost. It may be well to cover the seed bed with wet burlap to prevent the seeds from being washed out by spring rains. The burlap must be removed at the first signs of seedlings, otherwise the seedlings will elongate and be worthless. House-grown seedlings of annuals should be exposed to the April air and sunshine to harden. Pinch back any plants which seem to have weak, leggy stems. Sweet peas should have been planted in March, but may still be planted now.

This is the best time to plant the golden-banded lily of Japan, the regal lily, the speciosum lily, the Formosa lily, Henry's lily, and other lilies of this general class. Early irises may be dug and planted inside for early spring blooms. Cuttings of house plants as wandering jew, coleus, and others should be made now for setting out in beds later. There is still time to start dwarf dahlia, but the seeds should be sown indoors or in coldframes.

If pinched back, perennial phlox will give a long succession of flowers. Oriental poppies die down rather early and leave an ugly open space in the border. Such spaces can be closed by planting scarlet sage or hyacinthus.

The Lawn:—The lawn should be given a good coating of finely screened compost. Rake the bare spots with a steel rake and reseed them. By feeding the lawn now so that the lawn grasses make a rapid growth, you will not be

bothered with crab grass later. The crab grass is an annual and spends the winter in the seed stage. The crab grass seeds will germinate but cannot easily develop into plants if the ground is well covered with the lawn grasses. Fill the low spots with good soil and seed. If the fill is not too deep, the lawn grasses will grow up through the fill. Bone meal may also be added to the lawn.

Vegetable Garden:—It is time to sow the seeds and set out plants of the more hardy vegetables. Among others, plant asparagus, spinach, kohlrabi, onion seed, early cabbage, early celery, herbs, lettuce, parsnips, parsley, early peas, early potatoes, radishes, endive, Swiss chard, turnips, horseradish, beets, broccoli, Brussels sprouts; and tomatoes under glass. Late in April, sow pole beans. For earlier than usual vegetables, use hotcaps or glass gallon jugs as described on page 20 in the March issue of this magazine.

THE WEST

Flower Garden:—As soon as you see volunteer plants of any kind in the garden you may be sure that it is safe to plant the seeds of such plants. If you see a volunteer marigold, for instance, it is safe to set out in the border or bed marigold seedlings that you may have started indoors. Self sown seedlings are apt to be strong and are valuable plants providing you are sure of the variety to which they belong.

Set out chrysanthemums now. Sprout dahlia roots before putting them in the soil, or you can sprout them and transfer the rooted shoots to the garden. In this way many plants may be obtained from a single root. Transplant into the garden zinnias, marigolds, asters, petunias, and other half-hardy plants. Keep the gladiolus well watered and make repeated plantings for continuous bloom during the summer and fall. Transplant Transvaal daisies. Plants which do not like to be transplanted are nasturtium, portulaca, salpiglossis, mignonette, California poppy, and zinnia.

Summer bulbs should be planted late in April. In the Pacific Northwest, April is the month for snowdrops, scilla, crocus, winter aconite, puschkinias, and chinodoxas. Set out pyrethrums. Make cuttings of pentstemon, and separate the pampasgrass.

Vegetable Garden:—See suggestions for the North. Vegetables are classed as ultra-hardy, hardy, semi-hardy, tender, and very tender. All but the tender may be planted in April.

THE SOUTH

Flower Garden:—Prune spring-flowering shrubs and climbing roses which bloom only once a year *immediately after they have finished blooming*. Divide and reset chrysanthemums, and other perennials.

Seeds that may still be sown are sweet alyssum, four o'clock, moonflower, periwinkle, portulaca, sunflower, ageratum, marigold, torenia, petunia, cosmos, zinnia, and balsam.

Set out into the garden such heat-loving plants as gaillardia, zinnia, portulaca, ageratum, physostegia, and wishbone flower. For tropical backgrounds, plant in moist shady places bananas, elephants-ear, castor bean, canna, caladium, acalypha, coleus, ginger lily, and ricepaper plant. For dry sunny places, use bamboo, yucca, agave, Chinese hibiscus, lantana, cestrum, clerodendron, and the pampas and other grasses. The iceplant is recommended as a ground cover.

THE LOWER SOUTH *

Flower Garden:—Plant aster, scarlet runner bean, cosmos, Shasta daisy, gaillardia, globe amaranth, ornamental gourd, helianthus, marigold, morning glory, petunia, portulaca, salvia, tithonia, or Florida sunflower, verbena, periwinkle, zinnia.

Vegetable Garden:—A second planting of bush and pole beans is in order this month, and this is the last month for planting the bush variety. In fact,

* By Edwin H. Abrams, St. Cloud, Florida.

a number of things that were suitable earlier in the season will not withstand the warmer weather soon to come. In addition to the above, the following may now be planted: canteloupe, collard, mustard, okra, pumpkin, radish, roselle, spinach, New Zealand turnip, watermelon. Where earlier crops have left vacant spaces, sow cover crops such as cow peas, crotolaria, velvet beans, etc., to turn under at the proper time. Sunflowers, though considered a field crop, might well have a place in the garden. The large Russian variety is the best.

Shrubs and Trees:—The banana, one of the finest of foods, will repay any gardener living in central or southern Florida. Except for occasional frosts, this plant can be raised the entire year. If the mature plant is damaged, a number of shoots come up around the roots, and can be transplanted as soon as visible, or later after the plant has made some growth above ground and formed a good root system. One advantage of raising one's own bananas is that in addition to growing them the organic way, the fruit may be left on the plant longer than those that are shipped in from abroad. The fruit should not be allowed to ripen on the plant, as the bananas are inclined to split open. On the other hand, if left until a trifle of color shows, the ripening will proceed faster and the flavor will be better than when taken off too green. Several varieties do well here, including Cavendish, ladyfinger and red. The latter is the tallest growing, and sometimes needs support if subject to high winds.

SOUTH WEST **

Flower Garden:—Make root divisions of hardy asters (using strong single eyes), perennial phlox, Shasta daisies, coreopsis, gaillardias and hardy chrysanthemums. Put out from gallon can containers day-lilies (using some of the new evergreen hybrids), Aster Frikarti, Marconi, Shasta and Esther Reed, shastas, penstemons, rudbeckias, stokesias, kniphofias, and Reinwardtia.

From plant bands and flats continue planting from the above list, and in addition pansies, violas, tetra-snapdragons, early asters and semiflorens begonias. Toward the last of the month put out late asters, ageratum, marigolds, hardy chrysanthemums, late plantings of Iceland poppies, petunias, verbenas and seedling dahlias. Use all the compost you have available in preparing the soil for your plantings. Large dormant divisions of delphiniums and Transvaal daisies can be planted as long as available. When the soil has warmed up thoroughly sow the summer heat lovers, cosmos, marigolds and zinnias.

Summer flowering bulbs should be planted as soon as possible, cannas, crinums, ismenes, single and double Mexican tuberoses, late gladiolus, Amacrinum Howardii, agapanthus, Earlham hybrid, montbretias, Chlidanthus fragrans, evergreen sprekelia, tigridias and zephyranthes.

Vegetable Garden:—Sow for summer succession the hardy vegetables, carrots, beets, chard, late cabbage, kohlrabi, radishes and turnips. When the soil is thoroughly warmed up put in bush bean, pole beans, early corn and summer squash. At the end of the month set out your well grown plants of peppers, eggplant and tomatoes. Use the tomatoes selected and tested for your locality. From plant bands and flats set immediately late cabbage, celery, if you have rich soil, onion sets and seedlings and summer leaf lettuce, black seeded Simpson, Oak Leaf and Bibb. All pot shrubs can be set now.

Trees and Shrubs:—Prune poinsettias back to two good eyes and set cuttings of strong canes. Also at this time of year you can prune back to live wood the sub-tropicals and tropicals which were badly frozen the past winter. Continue selecting camellias, azaleas as to color and season of bloom. Citrus trees, balled and canned material, can be planted from now on. Select avocados according to your district. Be sure to put in some of the improved types of the hardy pineapple guava, Feijoa Sellowiana. Your well established nurseries which issue extensive catalogs are your best practical text-books. They also employ specialists in each department.

** By Charlotte M. Hoak, 1125 Stratford Ave., So. Pasadena, Calif.

Hints for the Vegetable Garden

POTATOES

The secret of producing a high yield of potatoes practically free from insect pests and diseases of both plants and tubers consists in the using of compost in the soil and a liberal mulch on the surface. Enrich the soil with compost and work it in the surface layers of the soil. Plant the potatoes in the regular way but do not cover them more than a few inches. As soon as the planting is finished, mulch the entire planting with straw or hay to a thickness of at least 12 inches. The potato plants will grow through the mulch and will need no attention until time to harvest the crop. Try this and report your results to the Editors of Organic Gardening magazine when the crop has been harvested this Fall.

—o—

CAULIFLOWER

The cultural requirements of cauliflower are much like those for cabbage. It is important to know, however, that cauliflower is more tender and cannot endure frost like cabbage, collard, kale, or Brussels sprouts. It is significant also that it will not head satisfactorily in the high heat of mid- or late-summer. It is a cool weather plant and should be grown so that it will head in spring and fall. Spring plants should be set out just as soon as danger of frost is past, and autumn plants should be set out from two to three months before the average date of the first killing frost of the region. As soon as the heads begin to form, tie the outer leaves up around the head to blanch it.

—o—

NITRATES IN VEGETABLES

Leafy vegetables grown in soils heavily fertilized with artificial chemical fertilizers which are highly soluble are apt to include nitrates in such amounts as to become poisonous. For details, see Mr. Rodale's editorial in this issue of the Organic Gardening magazine.

—o—

CONTROL OF JAPANESE BEETLES

The Japanese beetles are foreigners which we unintentionally imported into this country. They create a problem because their natural enemies as the milky disease and certain parasitic wasps are not yet sufficiently well established in this country. Until a proper and effective biological balance can be established, we can best deal with the Japanese beetles by growing plants in the garden which they prefer above all others. It is strange as it is interesting that they are most fond of geraniums which are poisonous to them. The odorless African marigolds are also preferred to most other garden plants. Marigold plants divert the beetles from other plants and serve as congregating places from which the beetles can be removed and destroyed.

ORGANIC GARDENING magazine will pay $3.00 for each *Hint for the Vegetable Garden* accepted for publication on this page. It should be an account of a method or technique of bringing a vegetable to its fullest expression and highest food value. It must be a product of your own garden experience and should not exceed 100 words in length.

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Hints for the Flower Garden

PRUNING SHRUBS

Spring pruning applies only to shrubs which produce flowers on the new growth as roses, franklinia, hydrangea, althea, butterfly bush, crepe myrtle, and others which bloom in middle or late summer. Often the removal of dead branches is all the pruning that is necessary. The more tender shrubs, as hydrangea and crepe myrtle, may be so badly winter killed that the removal of dead branches amounts to rather violent pruning. Shrubs which produce flowers on twigs which were produced the preceding year must not be pruned until after the blooming period in late spring or summer.

—o—

RHODODENDRONS

Rhododendrons belong to the Heath Family and, like all members of this family, require an acid, humus-rich soil. Rhododendrons are evergreens in contrast to their closest relatives, the Azaleas, which often are deciduous. Both of these groups of plants belong to the same genus.

Rhododendrons require good under-drainage, plenty of moisture and air in the soil, and plenty of compost derived from decayed woody material. In transplanting them to the garden, care must be taken to excavate a large hole and fill it with wood-compost which has the exact pH (degree of acidity) required for Rhododendrons. Do not use chemicals commonly recommended for creating acid soils. Be sure to plant shallow, so that the plants seem to be almost on the top of the soil with their roots barely covered.

—o—

ZINNIAS

Zinnias are Mexican plants and love lots of warm weather and sunshine. Although they may be started in flats indoors or in hotbeds and coldframes, zinnias do best when the seeds are sown where the plants are to grow. They hate to be transplanted. Sow the seeds in rows or broadcast them and when the plants are well-established, thin so that each plant has a good chance to undergo its fullest development. Zinnias are heavy feeders and need a well-composted soil. To keep the flowers coming, cut them freely for arrangements.

—o—

VINES

Vines have a dual purpose so far as landscaping the garden is concerned. They are admirably fitted for decorating good architecture, but never should be allowed to conceal it. Vines, especially the dense-growing kinds, may be used for screening out or obscuring an unpleasant view or object. Or dense-growing vines may be used for screening an open porch to give privacy. Some vines produce highly fragrant flowers, a desirable quality for garden and porch vines.

ORGANIC GARDENING magazine will pay $3.00 for each *Hint for the Flower Garden* accepted for publication on this page. The hint should be the result of your own experience, and should consist of approximately 100 words. It should be an account of your method of bringing the inherent qualities of a flowering plant to its fullest expression.

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FIFTEEN WAYS TO MAKE MONEY IN THE COUNTRY by Haydn S. Pearson (Grosset & Dunlap, Publishers, New York, New York. 1949. $2.00)

This book is addressed to those who would escape the artificial life of the cities and establish the good life and security on God's acres in the country. From his own experiences and the experiences of others, the writer outlines fifteen ways of earning a good living in the country. Cloth, 210 pages.

THE COMPLETE BOOK OF FLOWER ARRANGEMENT by F. F. Rockwell and Esther C. Grayson (The American Garden Guild, Inc. and Doubleday and Company, Inc., New York, New York. 1948. $4.95)

A highly important, very popular, but too little understood aspect of ornamental plants is their arrangement in floral displays. Here is one of the most comprehensive and most artistic volumes on the art of flower arrangement ever published. It treats in detail the making of artistic floral displays for the home, for flower-show competition, and other occasions involving flower arrangements. Attention is given to the roles of shapes and colors of flowers, containers, accessories, types of arrangements, and other helps which insure effective and artistic arrangements. Cloth, 308 pages. Profusely illustrated with colored plates, half tones, and line drawings.

GROWTH OF PLANTS—Twenty Years' Research at Boyce Thompson Institute by William Crocker (Reinhold Publishing Corporation, 330 West 42nd Street, New York 18, New York. 1948 $10.00)

This book is a fascinating story of scientific procedures in plant researches, clearly written and well illustrated. The Boyce Thompson Institute was founded for the study of *fundamental principles*. It began with the study of plant diseases and has since expanded to include every phase of plant life. Much attention has been given to dormancy and life span in seeds, the physiology of gases, plant hormones, and the growing of plants under precisely controlled environmental conditions. Cloth bound, 459 pages, 171 illustrations including colored plates.

EDITOR TRIES TO READ A BOOK!

J. I. RODALE, the editor and publisher of *Organic Gardening*, collects fine editions. But when he tried to read them, he found that most of his books were lengthy works, much too long for spare-time relaxation. A little research led Mr. Rodale to discover that a large number of the world's truly great masterpieces are short enough to afford keen pleasure in less than half an hour.

Unfortunately, collections of such literature seem to have been compiled by highbrows for highbrows. They're dull and stuffy. The only way Mr. Rodale could have better books to read—books containing irresistible reading matter in light, comfortable-to-hold, beautiful formats, in large type and with illustrations, decorations, and paper that rendered them fit companions for his *un*readable beautiful books—the only way Mr. Rodale could have them was to *publish* them!

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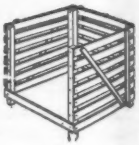

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ALFALFA

Q. Do you have any information on the growing of alfalfa the organic way?

Mrs. A. N. H.,
Cleveland Heights, Ohio.

A. Alfalfa can be grown successfully the organic way. Subsoil the soil if necessary to facilitate the circulation of water and air in the soil. Add enough raw limestone to neutralize the acids in the soil, or about one ton per acre. Add pulverized rock phosphate at the rate of ½ ton per acre. Then disk (not plow) the existing cover crop including weeds into the surface layers of the soil. When a good seed bed has been made, drill alone or with a nurse crop on the contour. Then cultipack the soil on the contour. During the first growing season, cut the alfalfa and other plants that grow as volunteers when they are from 8 to 10 inches high, but leave all plant materials on the ground as a mulch. The last cutting should be not later than the middle of September

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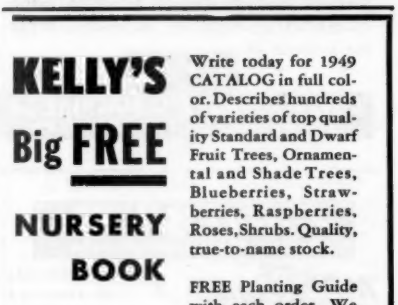
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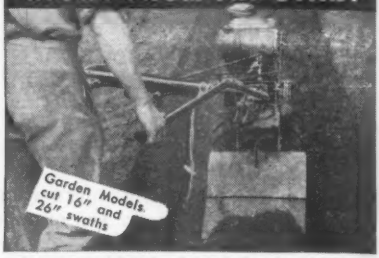

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so that a sufficient growth is made to insure good over-wintering of the alfalfa. The second year, cuttings for hay or ensilage can be made as often as there is sufficient growth.

—o—

ROTOTILLER AND EARTHWORMS

Q. Is the rototiller sufficiently injurious to earthworms to make its use questionable?

G. K., Elmira, N. Y.

A. The number of earthworms that will be killed by the rototiller is negligible. The earthworms are highly sensitive to vibrations caused by the tines of the rototiller in the earth and will rapidly move into deeper soil layers where they are safe.

—o—

ROOTONE

Q. What is rootone?

E. L. R., Toledo, Ohio.

A. Rootone is a root-forming hormone which greatly increases the for-

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Route 3 — Kent, Ohio

mation of roots on cuttings, and also shortens the time for rooting the cuttings. It can be used for rooting all kinds of cuttings.

—o—

TURNIPS

Q. When should turnips be planted and how should they be stored for winter?

E. C. W., Reedsville, Wis.

A. Turnip seeds should be sown in the latitude of Wisconsin about the middle of July for winter storage. For winter storage, the tops should be removed without cutting the root, and the turnips then layered in clean, moist sand and kept in a cool place as in a cool moist basement or in a cave.

—o—

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Q. I am building a basement hot house and will be using vermiculite in the trays which will need fertilizer.

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M. B. D., Colorado Springs, Col.

A. Vermiculite is a mica product which has no plant nutrients, so that it will be necessary to add a complete fertilizer. A well-balanced compost to which has been added pulverized limestone and rock phosphate should prove satisfactory.

—o—

GYPSUM

Q. What harm is there in using gypsum in the compost heap instead of lime?

W. P. C., Brawley, California.

A. Gypsum is a calcium sulphate whereas lime is calcium carbonate. The sulphur in the gypsum will accumulate in the compost and tend to make it too acid for good growth of most plants.

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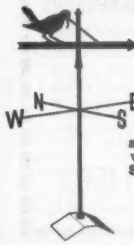

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